



INDIAN AGRICULTURAL
RESEARCH INSTITUTE, NEW DELHI.

I. A. R. I. 6.

MGIPC—84—10 AR—21-6-49—1,006.

UNITED STATES DEPARTMENT OF AGRICULTURE
AGRICULTURAL RESEARCH ADMINISTRATION
OFFICE OF EXPERIMENT STATIONS

EXPERIMENT STATION RECORD

VOLUME 95

JULY-DECEMBER 1946



UNITED STATES
GOVERNMENT PRINTING OFFICE
WASHINGTON : 1948

UNITED STATES DEPARTMENT OF AGRICULTURE

SECRETARY—CLINTON P. ANDERSON

AGRICULTURAL RESEARCH ADMINISTRATION

ADMINISTRATOR—W. V. LAMBERT

OFFICE OF EXPERIMENT STATIONS

CHIEF—R. W. TRULLINGER

ASSOCIATE CHIEF—E. C. ELTING

THE AGRICULTURAL EXPERIMENT STATIONS

ALABAMA—*Auburn*: M. J. Funchess.¹
ALASKA—*College*: D. L. Irwin.¹
ARIZONA—*Tucson*: P. S. Burgess.¹
ARKANSAS—*Fayetteville*: L. S. Ellis.¹
CALIFORNIA—*Berkeley 4*: C. B. Hutchison.¹
COLORADO—*Fort Collins*: H. J. Henney.¹
CONNECTICUT—

[New Haven] Station: *New Haven 4*:
J. G. Horsfall.²

Storrs Station: *Storrs*: W. B. Young.¹

DELAWARE—*Newark*: G. M. Worrlow.¹

FLORIDA—*Gainesville*: Harold Mowry.¹

GEORGIA—

Experiment: H. P. Stuckey.¹

Coastal Plain Station: *Tifton*: G. H.
King.¹

HAWAII—*Honolulu 10*: J. H. Beaumont.¹

IDAHO—*Moscow*: D. R. Theophilus.¹

ILLINOIS—*Urbana*: H. P. Rusk.¹

INDIANA—*La Fayette*: H. J. Reed.¹

IOWA—*Ames*: R. E. Buchanan.¹

KANSAS—*Manhattan*: R. I. Throckmorton.¹

KENTUCKY—*Lexington 29*: T. P. Cooper.¹

LOUISIANA—*University Station, Baton Rouge*
3: W. G. Taggart.¹

MAINE—*Orono*: Fred Griffee.¹

MARYLAND—*College Park*: W. B. Kemp.¹

MASSACHUSETTS—*Amherst*: F. J. Sievers.¹

MICHIGAN—*East Lansing*: V. R. Gardner.¹

MINNESOTA—*University Farm, St. Paul 1*:
C. H. Bailey.¹

MISSISSIPPI—*State College*: Russell Coleman.¹

MISSOURI—

College Station: *Columbia*: E. A. Trow-
bridge.¹

Fruit Station: *Mountain Grove*: P. H.
Shepard.¹

Poultry Station: *Mountain Grove*: T.
W. Noland.¹

MONTANA—*Bozeman*: Clyde McKee.¹

NEBRASKA—*Lincoln 1*: W. W. Burr.¹

NEVADA—*Reno*: C. E. Fleming.¹

NEW HAMPSHIRE—*Durham*: K. F. Chandler,
Jr.¹

NEW JERSEY—*New Brunswick*: W. H. Mar-
tin.¹

NEW MEXICO—*State College*: H. R. Varney.¹
NEW YORK—

State Station: *Geneva*: A. J. Heinicke.¹

Cornell Station: *Ithaca*: C. E. F. Guter-
man.¹

NORTH CAROLINA—*State College Station, Ra-*
leigh: J. H. Hilton.¹

NORTH DAKOTA—*State College Station*:
Fargo: H. L. Walster.¹

OHIO—*Wooster*: L. L. Rummell.¹

OKLAHOMA—*Stillwater*: W. L. Blizzard.¹

OREGON—*Corvallis*: W. A. Schoenfeld.¹

PENNSYLVANIA—*State College*: F. F. Linin-
ger.¹

PUERTO RICO—

Federal Station: *Mayaguez*: K. A. Bart-
lett.¹

University Station: *Rio Piedras*: Arturo
Roque.¹

RHODE ISLAND—*Kingston*: M. H. Campbell.¹

SOUTH CAROLINA—*Clemson*: H. P. Cooper.¹

SOUTH DAKOTA—*Brookings*: I. B. Johnson.¹

TENNESSEE—*Knoxville*: C. E. Brehm.¹

TEXAS—*College Station*: R. D. Lewis.¹

UTAH—*Logan*: R. H. Walker.¹

VERMONT—*Burlington*: J. E. Carrigan.¹

VIRGINIA—

Blacksburg: H. N. Young.¹

Truck Station: *Norfolk 1*: V. A. Tied-
jens.¹

WASHINGTON—*Pullman*: M. T. Buchanan.¹

WEST VIRGINIA—*Morgantown*: C. R. Orton.¹

WISCONSIN—*Madison 6*: I. L. Baldwin.¹

WYOMING—*Laramie*: J. A. Hill.¹

¹ Director.

² Vice Director.

EXPERIMENT STATION RECORD

EDITOR: HOWARD LAWTON KNIGHT

EDITORIAL DEPARTMENTS

Agricultural and Biological Chemistry—H. C. WATERMAN, GEORGIAN ADAMS.

Agricultural Meteorology—F. V. RAND.

Soils and Fertilizers—H. C. KNOBLAUCH, H. C. WATERMAN.

Agricultural Botany, Diseases of Plants—F. V. RAND, H. P. BAESS.

Genetics—H. M. STEECE, J. W. WELLINGTON, F. V. RAND, H. L. KNIGHT.

Field Crops—H. M. STEECE.

Horticulture and Forestry—J. W. WELLINGTON.

Economic Zoology and Entomology—F. V. RAND.

Animal Husbandry, Dairying and Dairy Farming—H. L. KNIGHT.

Veterinary Medicine—H. L. KNIGHT.

Agricultural Engineering—B. C. REYNOLDS.

Agricultural Economics—B. YOUNGBLOOD.

Rural Sociology—B. YOUNGBLOOD.

Agricultural and Home Economics Education—B. YOUNGBLOOD.

Foods and Human Nutrition, Home Management and Equipment—GEORGIAN ADAMS, CHRISTINE JUSTIN.

Textiles and Clothing—GEORGIAN ADAMS, CHRISTINE JUSTIN.

Indexes—LAURA LOUISE CROUSE.

Bibliographies—CORAL FELDkamp.

Cooperation with *Biological Abstracts*—F. V. RAND.

CONTENTS OF VOLUME 95

STATION PUBLICATIONS ABSTRACTED

ALABAMA STATION:	Page	ARKANSAS STATION:	Page
Circular 92.....	57	Bulletin 458.....	893
Circular 93.....	684	Bulletin 459.....	866
Biennial Report 1943-44... 131, 143		Bulletin 460.....	262
ALASKA STATION:		Bulletin 462.....	834
Bulletin 12.....	190	CALIFORNIA STATION:	
Circular 6.....	92	Bulletin 693.....	48
ARIZONA STATION:		Bulletin 695.....	76
Bulletin 197.....	629	Bulletin 696.....	502
Bulletin 198.....	90	Bulletin 697.....	343
Bulletin 199.....	665	Circular 364.....	205
Bulletin 200.....	28	Mimeographed Report 86... 408	
Bulletin 201.....	29	Mimeographed Report 87 .. 873	
Bulletin 202.....	111	Hilgardia, vol. 17—	
Mimeographed Report 71... 131		No. 1, Oct. 1945... 363	
Mimeographed Report 72... 137		No. 2, Jan. 1946..... 324	
Mimeographed Report 73... 122		Sweet Corn Suckering Trials	
Mimeographed Report 74... 278		in California..... 815	
Mimeographed Report 77... 273		The Home Pickling of Olives.. 125	
Mimeographed Report 81... 686			

COLORADO STATION :		Page	GEORGIA STATION—Continued		Page
Bulletin 489.....		267	Bulletin 246.....		871
Bulletin 490.....		500	Circular 148.....		24
Bulletin 491.....		868	Circular 149.....		502
Bulletin 492.....		818	Circular 150.....		269
Bulletin 493.....		862	Press Bulletin 567.....		735
Technical Bulletin 34.....		861	Southern Cooperative Series		
Colorado Farm Bulletin, vol.			Bulletin 3.....		742
7—			Southern Cooperative Series		
No. 5, Sept.—Oct. 1945..		231,	Bulletin 5.....		888
		253, 254, 287	Annual Report 1945.....		436
No. 6, Nov.—Dec. 1945..		177,			
		206, 233, 235, 253, 285			
Colorado Farm Bulletin, vol.					
8—					
No. 1, Jan.—Feb. 1946..		329,			
		331, 444			
No. 2, Mar.—Apr. 1946..		336,			
		375, 444			
No. 3, May—June 1946..		693,			
		704, 722, 756			
Annual Report 1945.....		436, 437			
CONNECTICUT [NEW HAVEN] STA- TION :					
Bulletin 485.....		531			
Bulletin 488 (Annual Report 1944).....		352			
Bulletin 489.....		122			
Bulletin 490.....		38			
Bulletin 491.....		354			
Bulletin 492.....		313			
Bulletin 493.....		662,			
		669, 670, 691			
Bulletin 494.....		572			
DELAWARE STATION :					
Bulletin 256.....		330			
Bulletin 257.....		52			
Bulletin 258.....		678			
Bulletin 259.....		900, 901			
Bulletin 260.....		858, 859			
Bulletin 261.....		694			
Circular 18.....		664			
Pamphlet 23.....		895			
FLORIDA STATION :					
Bulletin 419.....		193			
Bulletin 420.....		96			
Bulletin 421.....		233			
Annual Report 1945.....		877,			
		886, 901			
GEORGIA STATION :					
Bulletin 240.....		404			
Bulletin 244.....		261			

KANSAS STATION :	Page	MICHIGAN STATION :	Page
Bulletin 327-----	139	Special Bulletin 334-----	263
Bulletin 328-----	805	Special Bulletin 335-----	99
Circular 232-----	444	Special Bulletin 336-----	260
Circular 235 (Circular 199 rev.)-----	816	Technical Bulletin 202-----	86
Circular 236-----	875	Quarterly Bulletin, vol. 28—	
		No. 2, Nov. 1945-- 7, 47, 49, 88, 109, 111, 115, 118, 123	
KENTUCKY STATION :		No. 3, Feb. 1946-- 311, 328, 331, 344, 357, 360, 380, 400	
Bulletin 481-----	409	No. 4, May 1946----- 622, 656, 661, 675, 677, 683, 703, 704, 722, 723, 732, 734.	
Bulletin 482-----	245	Annual Report 1945-----	752
Regulatory Series Bulletin 46-----	546		
Annual Report 1945-----	894, 905	MINNESOTA STATION :	
LOUISIANA STATION :		Bulletin 389-----	117
Bulletin 395-----	113	Technical Bulletin 169 --	188
Bulletin 396-----	194	Technical Bulletin 170-----	225
Bulletin 397-----	116	Technical Bulletin 172-----	494
Bulletin 398-----	114	Technical Bulletin 173-----	186
Bulletin 399-----	116	Technical Bulletin 174-----	800
Bulletin 400-----	584	Technical Bulletin 175-----	836, 837
Bulletin 401-----	515	Minnesota Farm and Home Science, vol. 3—	
Bulletin 402-----	504	No. 2, Feb. 20, 1946-----	312, 328, 331, 338, 402, 435
Bulletin 403-----	874	No. 3 May 20, 1946-----	501, 506, 512, 531, 584, 589, 607
Bulletin 404-----	880	Minnesota's Farm Population Prospects-----	586
Bulletin 405-----	891	Progress in Development of a Land and Timber Man- agement Program in Northeastern Minnesota--	114
Dairy Research Digest, vol. 4—		Annual Report 1945 -----	439
No. 1, March 1946 -----	192, 193, 231, 238		
No. 2, June 1946 -----	848	MISSISSIPPI STATION :	
No. 3, Sept. 1946 -----	848	Bulletin 409-----	332
Annual Report 1945-----	898, 906	Bulletin 415-----	735
MAINE STATION :		Bulletin 417-----	180
Bulletin 439-----	198	Bulletin 421-----	115
Bulletin 440-----	579	Bulletin 422-----	114
Bulletin 441-----	580	Bulletin 425-----	371
Official Inspections 198-----	201	Bulletin 426-----	196
MARYLAND STATION :		Bulletin 427-----	806
Bulletin A38-----	527	Bulletin 428-----	503
Bulletin A40-----	731	Circular 124-----	312
Bulletin A41-----	733	Mississippi Farm Research, vol. 9—	
Bulletin A42-----	868	No. 1, Jan. 1946 -----	170, 177, 186, 219, 233, 287
MASSACHUSETTS STATION :		No. 2, Feb. 1946-----	633, 654, 667, 675, 717, 736, 743 756.
Bulletin 428 (Annual Report 1945)-----	302, 303, 308, 401, 404, 406, 437		
Bulletin 429-----	380		
Bulletin 430-----	864		
Bulletin 432-----	812		
Control Series Bulletin 120--	790		
Control Series Bulletin 127--	504		

MISSISSIPPI STATION—Continued		Page	NEW JERSEY STATIONS:		Page
Mississippi Farm Research, vol. 9—Continued			Bulletin 720-----		378
No. 3, Mar. 1946-----		786,	Bulletin 721-----		174
817, 870, 886, 910			Bulletin 722-----		236
No. 4, Apr. 1946-----		804,	Bulletin 723-----		236
815, 829, 846, 884, 910.			Bulletin 724-----		507
Southern Cooperative Series			Bulletin 725-----		504
Bulletin 5-----		888	Bulletin 726-----		816
MISSOURI STATION:			Bulletin 727-----		805
Bulletin 490 (Biennial Re- port)-----		438	Circular 500-----		879
Bulletin 491-----		409, 411, 422, 440	Inspection Series 20-----		816
Bulletin 492-----		193	Hints to Poultrymen, vol. 32—		
Bulletin 493-----		313	No. 4, Apr.—May 1945---		257
Bulletin 494-----		98	No. 5, June—July 1945---		578
Research Bulletin 396-----		246	Plant Disease Notes, vol. 23—		
Research Bulletin 397-----		372	No. 1, Jan. 1946-----		216
Research Bulletin 398-----		394	No. 2, Feb. 1946-----		215
Research Bulletin 401-----		873	No. 3, Mar. 1946-----		676
Research Bulletin 402-----		800	NEW MEXICO STATION:		
Circular 306-----		205	Bulletin 327-----		889
Circular 307-----		202	Bulletin 328-----		706
Circular 308-----		201	Bulletin 329-----		869
Circular 309-----		833	Annual Report 1945-----		440
MONTANA STATION:			[NEW YORK] CORNELL STATION:		
Bulletin 431 (Bulletin 388 revised)-----		501	Bulletin 821-----		331
Bulletin 433-----		375	Bulletin 824-----		816
Bulletin 434-----		845	Bulletin 825-----		264
Bulletin 435-----		849	Bulletin 826-----		730
Circular 184-----		842	Bulletin 827-----		405
NEBRASKA STATION:			Bulletin 828-----		504
Bulletin 380-----		110	Bulletin 829-----		215
Bulletin 381-----		83	Bulletin 830-----		403
Bulletin 382-----		481	Bulletin 831-----		311
Research Bulletin 142-----		237	Bulletin 832-----		838
Research Bulletin 143-----		82	Bulletin 833-----		751
Research Bulletin 144-----		378	Bulletin 834-----		843
Research Bulletin 145-----		565	Mimeograph Bulletin 18-----		119
Research Bulletin 146-----		547	Mimeograph Bulletin 19-----		119
Research Bulletin 147-----		858	Memoir 261-----		656
Circular 81-----		846	Memoir 272-----		798
Agricultural Engineering			A. E. 546-----		262
Progress Report 13-----		259	A. E. 550-----		730
Agricultural Engineering			A. E. 551-----		262
Progress Report 14-----		255	A. E. 554-----		798
Annual Report 1945-----		897, 907	A. E. 562-----		711
NEVADA STATION:			A. E. 563-----		711
Bulletin 176-----		578	Farm Research, vol. 12—		
Bulletin 177-----		573	No. 2, Apr. 1, 1946-----		328,
			330, 342, 356, 358, 360,		
			362, 379, 401, 444.		
			No. 3, July 1, 1946-----		803, 813,
			814, 815, 817, 824, 825,		
			834, 840, 870, 874, 880		

[NEW YORK] CORNELL STATION—	Page	OHIO STATION—Continued	Page
Continued		Bimonthly Bulletin 238.....	50, 98, 110
Annual Report 1945.....	766, 768, 908	Bimonthly Bulletin 239.....	343, 361, 370, 381, 432
NEW YORK STATE STATION :		Bimonthly Bulletin 240.....	779, 816, 847, 849, 862, 872
Bulletin 714.....	72	Bimonthly Bulletin 241.....	847, 872, 877
Bulletin 715.....	361	Special Circular 73.....	799
Bulletin 717.....	333	OKLAHOMA STATION :	
Bulletin 718.....	307	Bulletin 291.....	117
Bulletin 719.....	307	Bulletin 292.....	195
Bulletin 720.....	413	Bulletin 293.....	214
Technical Bulletin 276.....	147	Bulletin 294.....	210
Farm Research, vol. 12—		Bulletin 295.....	679, 723, 753
No. 2, Apr. 1, 1946.....	328, 330, 342, 356, 358, 360, 362, 379, 401, 444.	Bulletin 296.....	373
No. 3, July 1, 1946.....	803, 813, 814, 815, 817, 824, 825, 834, 840, 870, 874, 880.	Bulletin 297.....	663
NORTH CAROLINA STATION :		Bulletin 299.....	865
Bulletin 354.....	192	Technical Bulletin 23.....	204
Technical Bulletin 81.....	884	Circular 121.....	326
Research and Farming, vol. 4—		Circular 122.....	264
Progress Report 2, Jan. 1946.....	513, 536, 547, 577, 586, 607	Circular 123.....	865
Progress Report 3, Apr. 1946.....	662, 665, 691, 702, 732, 756	Miscellaneous Publication 9..	812
Southern Cooperative Series		Current Farm Economics, vol. 19—	
Bulletin 3.....	742	No. 1, Feb. 1946.....	264
NORTH DAKOTA STATION :		No. 2, Apr. 1946.....	402
Bulletin 337.....	867	No. 3, June 1946.....	863
Bulletin 338.....	780	No. 4, Aug. 1946.....	863
Circular 73.....	853	What's New in Oklahoma Re- search, No. 10, Nov. 1945..	756
Bimonthly Bulletin, vol. 8—		OREGON STATION :	
No. 3, Jan.-Feb. 1946....	168, 180, 199, 210, 211, 287	Bulletin 429.....	113
No. 4, Mar.-Apr. 1946....	328, 336, 360, 379, 444	Bulletin 430.....	852
No. 5, May-June 1946....	656, 722, 756	Bulletin 431.....	843
OHIO STATION :		Bulletin 435.....	828
Bulletin 659.....	634, 727, 732, 750, 751, 752	Circular 167.....	112, 114
Bulletin 660.....	871	PENNSYLVANIA STATION :	
Department of Rural Eco- nomics Bulletin 187.....	410	Bulletin 475, Supplement 1..	506, 531, 581
Department of Rural Eco- nomics—		Journal Series Paper 1331....	729
Mimeograph Bulletin No. 189.....	409	PUERTO RICO FEDERAL STATION :	
Mimeograph Bulletin No. 190.....	405	Circular 25 (Spanish edi- tion).....	162
		Report 1944 (Spanish edi- tion).....	441
		Report 1945.....	605
		PUERTO RICO UNIVERSITY STA- TION :	
		Bulletin 66 (Spanish edi- tion).....	76

PUERTO RICO UNIVERSITY STA- TION—Continued	Page	VERMONT STATION :	Page
Bulletin 67 (Spanish edi- tion).....	55	Bulletin 529.....	733
Bulletin 68.....	837	Bulletin 530.....	751
Bulletin 69.....	727	Bulletin 531.....	728
Research Bulletin 5.....	22	Bulletin 532.....	868
		Bulletin 534.....	850
		Annual Report 1945.....	286
SOUTH CAROLINA STATION :		VIRGINIA STATION :	
Bulletin 365.....	865	Bulletin 371.....	260
Circular 72.....	865	Bulletin 372.....	260
Annual Report 1945.....	815,	Bulletin 373.....	582
865, 876, 877, 878, 883, 891, 909		Bulletin 376.....	260
		Bulletin 377.....	582
SOUTH DAKOTA STATION :		Bulletin 379.....	260
Circular 60.....	195	Bulletin 380.....	582
Circular 61.....	202	Bulletin 381.....	582
Circular 62.....	201	Bulletin 385.....	260
Circular 63.....	433	Bulletin 386.....	200
TENNESSEE STATION :		Bulletin 387.....	582
Bulletin 199.....	660	Bulletin 388.....	694
Bulletin 200.....	803	Bulletin 389.....	695
Circular 93.....	47	Bulletin 390.....	629
Agricultural Economics and Rural Sociology Depart- ment—		Bulletin 391.....	728
Monograph 194.....	112	Bulletin 392.....	728
Monograph 195.....	111	Bulletin 394.....	677
Monograph 196.....	404	Bulletin 396.....	723
Monograph 197.....	407	Technical Bulletin 97.....	685
Monograph 198.....	583	Technical Bulletin 98.....	835
Monograph 199.....	729	Technical Bulletin 99.....	710
Monograph 200.....	728	Technical Bulletin 100.....	857
Monograph 201.....	729	Southern Cooperative Series	
Monograph 202.....	870	Bulletin 5.....	888
Monograph 204.....	869	VIRGINIA TRUCK STATION :	
Annual Report 1944.....	754	Southern Cooperative Series	
		Bulletin 5.....	888
TEXAS STATION :		WASHINGTON STATION :	
Bulletin 675.....	275	Bulletin 463.....	586
Bulletin 676.....	112	Bulletin 469.....	91
Bulletin 677.....	659	Bulletin 470 (Annual Report 1945).....	442
Bulletin 678.....	706	Bulletin 471.....	705
Circular 110.....	476	Bulletin 472.....	867
UTAH STATION :		Popular Bulletin 180.....	418
Bulletin 320.....	570	Popular Bulletin 182.....	257
Bulletin 322.....	583	WEST VIRGINIA STATION :	
Farm and Home Science, vol. 7—		Bulletin 321.....	476
No. 1, Mar. 1946.....	312,	Bulletin 322.....	202
330, 370, 444		Bulletin 323.....	263
No. 2, June 1946.....	664,	Bulletin 324.....	192
678, 688, 693, 726, 757		Bulletin 325.....	235
		Special Circular 1.....	118
		Special Circular 2.....	865

WISCONSIN STATION :	Page	WYOMING STATION :	Page
Bulletin 468 (Annual Report 1945), pt. 1-----	297, 314, 400, 441	Bulletin 274-----	505
Research Bulletin 158-----	726	Bulletin 275-----	559
		Report 1943-----	605

UNITED STATES DEPARTMENT OF AGRICULTURE PUBLICATIONS ABSTRACTED

Technical Bulletin—	Page	Miscellaneous Publications—Con.	Page
907-----	656	593-----	482
908-----	54	594-----	261
909-----	188	595-----	403
910-----	204	596-----	311
911-----	478	597-----	257
912-----	633	598-----	404
913-----	115	600-----	333
914-----	381	601-----	830
915-----	796	602-----	410
916-----	631	603-----	875
917-----	725	605-----	505
920-----	777	608-----	724
Farmers' Bulletin—		AIS—	
684 (rev.)-----	552	44-----	257
1852 (rev.)-----	197	48-----	418
1950 (rev.)-----	724	Agricultural Statistics, 1945-----	585
1971-----	83	Crops and Markets, vol. 23—	
1977-----	505	No. 1, Jan. 1946-----	264
Bibliographical Bulletin 7-----	333	No. 2, Apr. 1946-----	585
Circular—		Report of the Secretary of Agri- culture, 1945-----	118, 119, 120, 140
741-----	503	AGRICULTURAL RESEARCH ADMIN- ISTRATION :	
745-----	365	Report of the Administrator, 1945-----	41, 90, 97, 99, 121, 140, 141
746-----	364	BUREAU OF AGRICULTURAL AND IN- DUSTRIAL CHEMISTRY :	
747-----	822	Report of the Chief, 1945-----	141
748-----	501	BUREAU OF AGRICULTURAL ECO- NOMICS :	
749-----	679	F. M. 51-----	260
750-----	815	F. M. 52-----	581
Leaflet 147 (rev.)-----	838	F. M. 53-----	259
Miscellaneous Publication—		F. M. 55-----	582
80 (rev.)-----	201	F. M. 56-----	583
349 (rev.)-----	860	F. M. 57-----	870
544 (rev.)-----	735	F. M. 58-----	863
559-----	635	Agricultural Finance Review, vol. 8, Nov. 1945-----	406
585-----	263		
586-----	632		
587-----	97		
588-----	271		
589-----	110		
590-----	192		
591-----	139		
592-----	121		

BUREAU OF AGRICULTURAL ECONOMICS—Continued	Page	BUREAU OF ENTOMOLOGY AND PLANT QUARANTINE:	Page
Agricultural Situation, vol. 30, No. 5, May 1946.....	409	Review of United States Patents Relating to Pest Control, vol. 18—	
World Trends in Major Oil Crops	405	Nos. 1-5, Jan.-May 1945..	222
Surveys of Wages and Wage Rates in Agriculture—		No. 7, July 1945.....	222
Report 5	406	Nos. 9-12, Sept.-Dec. 1945	222
Report 6	406	Report of the Chief, 1945....	141
Agricultural Land Ownership and Operation in the Southern San Joaquin Valley....	260	OFFICE OF EXPERIMENT STATIONS:	
Attitudes of Rural People Toward Radio Service....	120	OES-R1.....	142
Cash Receipts From Farming by States and Commodities, Calendar Years 1924-44	585	Report of the Chief, 1945..	142
Citrus Fruits: Production, Farm Disposition, Value, and Utilization of Sales, Crop Seasons 1909-10-1943-44	405	Report of the Agricultural Experiment Stations, 1945..	142
Economics of Scale of Farming in the Southern San Joaquin Valley, California.....	864	EXTENSION SERVICE:	
Farm Production, Farm Disposition, and Value of Cotton and Cottonseed, and Related Data, 1928-44, by States.....	264	Report 1946.....	734
Farm Production, Farm Disposition, and Value of Principal Crops, 1944-45.....	585	Conference Report on the Contribution of Extension Methods and Techniques Toward the Rehabilitation of War-Torn Countries....	265
Postwar Packages and Containers for Marketing Foods.....	126	FARM CREDIT ADMINISTRATION:	
Readjustments in Processing and Marketing Citrus Fruits	870	Circular C-108 (rev.).....	118
BUREAU OF ANIMAL INDUSTRY:		Circular E-30.....	583
Seventh Annual Report of the Regional Poultry Research Laboratory.....	859	Miscellaneous Report 95....	408
Report of the Chief, 1945..	41,	Miscellaneous Report 95A..	408
90, 99, 121, 141		Miscellaneous Report 96....	408
BUREAU OF DAIRY INDUSTRY:		Miscellaneous Report 97....	584
Report of the Chief, 1945....	42, 97	Miscellaneous Report 98....	729
		Miscellaneous Report 99....	872
		Annual Report 1945.....	406
		FEDERAL CROP INSURANCE CORPORATION:	
		Report of the Manager, 1945..	117
		OFFICE OF FOREIGN AGRICULTURAL RELATIONS:	
		Agriculture in the Americas, vol. 6—	
		No. 2, Feb. 1946.....	55
		No. 3, Mar. 1946.....	204
		No. 4, Apr. 1946.....	606
		No. 5, May 1946.....	507
		No. 6-7, June-July 1946..	507,
			606
		No. 8, Aug. 1946....	664, 666, 667

OFFICE OF FOREIGN AGRICULTURAL RELATIONS—Continued	Page	BUREAU OF PLANT INDUSTRY, SOILS, AND AGRICULTURAL EN- GINEERING :	Page
Foreign Agriculture, vol. 10—		[Soil Survey Report]—	
No. 2, Feb. 1946.....	263	Series 1936—	
No. 3, Mar. 1946.....	263	No. 22.....	312
No. 4, Apr. 1946.....	403	No. 23.....	312
No. 5, May 1946.....	334, 403	Series 1937—	
Nos. 6-7, June-July		No. 16.....	25
1946.....	724	Plant Disease Reporter—	
No. 8, Aug. 1946.....	911	Vol. 28—	
No. 9, Sept. 1946.....	911	No. 40 (Index Num- ber), June 15,	
Agricultural Geography of the Philippine Islands....	282	1946.....	819
Climatology of Norway and its Climate Parallels in North America.....	168	Vol. 30—	
Conference Report on the Contribution of Extension Methods and Techniques Toward the Rehabilitation of War-Torn Countries....	265	No. 2, Feb. 15, 1946..	57
The Agricultural Climatology Vegetative Cover, and Crop Ecology of the Ukraine and the Ukranian Climatic An- alogues in North America..	168	No. 3, Mar. 15, 1946..	57
		No. 4, Apr. 15, 1946..	335
		No. 5, May 15, 1946..	335
		No. 6, June 15, 1946..	819
		No. 7, July 15, 1946..	819
		Supplement 151, May 15,	
		1946 (Index to Supple- ments 145-150, 1944) ..	336
		Supplement 160 (Index to Supplements 152- 159, 1945).....	670
		Supplement 161.....	674
		Supplement 162.....	670
		Supplement 163, June 15,	
		1946	821
		Supplement 164, July 15,	
		1946	824
		Report of the Chief, 1945....	142
FOREST SERVICE :		PRODUCTION AND MARKETING AD- MINISTRATION :	
Caribbean Forester, vol. 7—		CS-16.....	116
No. 1, Jan. 1946.....	148, 206	CS-17.....	585
No. 2, Apr. 1946....	667, 669, 696	Food Consumption Levels in the U. S., Canada, and the United Kingdom: Third Report of a Special Joint Committee Set Up by the Combined Food Board....	590
No. 3, July 1946.....	818	SOIL CONSERVATION SERVICE :	
BUREAU OF HUMAN NUTRITION AND HOME ECONOMICS :		Physical Land Survey No.	
Report of the Chief, 1945....	141	38	784
LIBRARY :		Report of the Chief, 1945....	26
Library List—			
2 (rev.).....	868		
22.....	407		
23.....	206		
24.....	284		
25.....	287		
26.....	591		
27.....	790		

JOURNAL OF AGRICULTURAL RESEARCH

Vol. 72—		Page	Vol. 72—Continued		Page
No. 3, Feb. 1, 1946.....		6, 48	No. 10, May 15, 1946.....		536
No. 4, Feb. 15, 1946.....		6, 65	No. 11, June 1, 1946.....		486
No. 5, Mar. 1, 1946.....	193, 203		No. 12, June 15, 1946.....		545, 546
No. 6, Mar. 15, 1946.....	203		Vol. 73—		
No. 7, Apr. 1, 1946....	203, 210, 216		No. 1, July 1, 1946.....		645
No. 8, Apr. 15, 1946..._	525, 537, 545		No. 2, July 15, 1946....		822, 823, 826
No. 9, May 1, 1946.....	493, 517		No. 3, Aug. 1, 1946....		797, 806, 832

EXPERIMENT STATION RECORD

Vol. 95

JULY 1946

No. 1

RECENT WORK IN AGRICULTURAL SCIENCE¹

AGRICULTURAL AND BIOLOGICAL CHEMISTRY

Efficient statistical methods in chemistry, J. MANDEL (*Indus. and Engin. Chem., Analyt. Ed.*, 17 (1945), No. 4, pp. 201-206).—"Statistical procedures are described for the evaluation and comparison of precisions, and for the estimation of accuracies. . . . Special emphasis is placed on the practical interpretation of the statistical tests and computations."

Organic preparations, C. WEYGAND (*New York 3: Interscience Pubs*, 1945, pp. 534+, *illus.* 12).—This volume is a translation of part II, "Reaktionen," *Organisch-chemische Experimentierkunst*, published in Leipzig in 1938. In this translation the extensive quotations from *Organic Syntheses* have been reduced to references.

The more important general reactions are taken up by classes indicated by the contents, in related groups under these main headings, and with relation to the preparation of compounds of the specific types. Each reaction is discussed rather in terms of its general application than in connection with a single typical preparation. Detailed procedures for the preparation of individual compounds are abundantly used as illustrations of points brought up in discussions of general technics, however, both typical instances and those requiring special treatment being used in this way.

Following a publisher's note, prefaces, and a general introduction, the contents are: Formation of carbon-hydrogen bonds, formation of carbon-halogen bonds, formation of carbon-oxygen bonds, cleavage of carbon-oxygen bonds, formation of organic derivatives of trivalent nitrogen, cleavage of carbon-nitrogen bonds, formation of carbon-pentavalent nitrogen linkages, carbon-divalent sulfur bonds, carbon-hexavalent sulfur bonds, unsaturated carbon bonds, formation of carbon-carbon bonds, fission of carbon-carbon bonds, rearrangements of carbon compounds with the exception of steric rearrangements, and index.

Leucine content of proteins and foodstuffs, E. BRAND, F. J. RYAN, and E. M. DISKANT (*Jour. Amer. Chem. Soc.*, 67 (1945), No. 9, pp. 1532-1534).—A strain of *neurospora crassa* containing no leucine was used for the determination of this amino acid in the hydrolyzates of a number of proteins and of a few foodstuffs. The

¹ The publications abstracted in these columns are seldom available for distribution by the Office of Experiment Stations. In general, application should be made to the Office of Information of the U. S. Department of Agriculture, Washington 25, D. C., for publications of the Department; to the directors of the State agricultural experiment stations, as listed on page 3 of the cover of this issue, for publications of the several experiment stations; and to publishers of books and journals for material issued by them. Microfilms and photostatic copies, the latter legible without magnifying equipment, may be purchased from the Library, U. S. Department of Agriculture, Washington 25, D. C. Rates and other details will be supplied by the Library on request.

accuracy of this procedure was indicated by an independent determination of the leucine content of β -lactalbumin made by means of an isotope dilution method, the respective figures being 15.4 and 15.7 percent.

Ribonuclease was the only protein in which no leucine could be detected. Of the proteins examined, silk fibroin had the lowest leucine content (0.8 percent). Gelatin (containing 3.6 percent) was next. Leucine was found to account for an appreciable part of the molecule in zein (15.4 percent), bovine (13.7 percent), human (11.9 percent) and horse (13.0 percent) serum albumin, horse (15.7 percent) and human (14.7 percent) hemoglobin, insulin (13.4 percent) and β -lactoglobulin (15.6 percent). Chymotrypsinogen, insulin, and β -lactoglobulin were calculated to contain 29, 45, and 50 residues of leucine, respectively, per mole of protein.

Viscosity patterns of peanut protein solutions: Comparison with other vegetable proteins and with casein. R. S. BURNETT, E. J. ROBERTS, and E. D. PARKER. (U. S. D. A.). (*Indus. and Engin. Chem.*, 37 (1945), No. 3, pp. 276-281, illus. 7).—Methods for preparing and determining the viscosity of vegetable protein solutions at useful concentrations are described. Data presented show the influence of concentration, heat, pH, time, and other factors on the viscosity relations of peanut protein solutions made alkaline with sodium hydroxide. These factors were found to be, in turn, influenced by the conditions under which the peanut meal is prepared, by the methods employed in separating the protein from the meal, and by the subsequent treatment received by the separated protein. The viscosity behavior of peanut protein solutions is compared with that of solutions of casein and of soybean and cottonseed proteins.

The reaction of formaldehyde with *l*(-)-histidine. D. C. CARPENTER. (N. Y. State Expt. Sta.). (*Jour. Amer. Chem. Soc.*, 67 (1945), No. 8, pp. 1247-1249, illus. 3).—Having shown, by means of a polariscopic method devised for a previous investigation of the behavior of asparagine, aspartic acid, and glutamic acid, that formaldehyde reacts with amino acids in equimolecular proportions to form fairly stable compounds, and in the proportion of two molecules of the aldehyde to one of the amino acid to form highly unstable compounds (E. S. R., 89, p. 275), the author here reports upon the application of a similar procedure in an investigation of the reaction of formaldehyde with *l*(-)-histidine, the course of this reaction having been followed by means both of polariscopic and of hydrogen-ion concentration measurements.

In solutions containing *l*(-)-histidine with one molecular equivalent of sodium hydroxide, and under the experimental conditions here specified, two definite compounds appeared with the addition of increasing quantities of formaldehyde. One of these, formed from equimolecular proportions of the aldehyde and the amino acid, was stable and showed an angular rotation of -24.10° [C.]. A second compound appeared when the proportion of formaldehyde added reached three molecular equivalents of the aldehyde to two equivalents of the amino acid. This second compound was not stable. Its angular rotation was -3.30° . Because of the instability of the 2:3 compound, the author considers it more likely to have the structure $R-NH.CH_2O-CH_2NH.R$ than that which would result from the reaction of the formaldehyde with the imino groups of two imidazole rings. The equilibrium constant of the second reaction was calculated as $k = 0.00658$. A graphic method, based upon the logarithmic form of the equilibrium equation, gave $k = 0.00652$, in good agreement with the calculated value.

The empirical formula of β -lactoglobulin. E. BRAND, L. J. SAIDEL, W. H. GOLDWATER, B. KASSELL, and F. J. RYAN (*Jour. Amer. Chem. Soc.*, 67 (1945), No. 9, pp. 1524-1532).—Data concerning the elementary and amino acid composition of crystalline β -lactoglobulin are presented. From the hydrolysis of 100 gm. of protein, 116.73 gm. of split products of 99.62 gm. on a residue basis were obtained;

17.11 gm. of water was taken up during hydrolysis. A minimum molecular weight ($M_{min.}$) of $42,020 \pm 105$ was calculated almost identical with the molecular weight ($M_s = 41,600$). β -Lactoglobulin was, therefore, monomolecular in solution. The atomic empirical formula was found to be: $C_{1884}H_{2712}N_{408}S_{21}O_{778}$. The empirical formula in terms of amino acid residues (using the first three letters of each as the symbol for the amino acid residues) was found to be: Gly₄Ala₂₀Val₁₁Leu₁₀Ileu₁₇Pro₁₈Phe₈Cys₄(Cys)₁Met₁Try₄Arg₇His₄Lys₂₃Asp₂₀Glu₂₄(Glu-NH₂)₂₂Ser₂₀Thr₂₁Tyr₉(H₂O)₄. β -Lactoglobulin was found to consist of 370 amino acid residues with 366 peptide bonds, arranged in four subunits (polypeptide chains). The average residue weight was calculated as 113.7-113.9.

"It can be concluded that the constituent amino acids are primarily linked by typical peptide bonds; other linkages, such as atypical peptide bonds (as in glutathione), esters, anhydrides, or imides, if they are present at all, can be present only in extremely small numbers."

Iodination of tyrosine groups in serum albumin and pepsin, C. H. LI. (Univ. Calif.). (*Jour. Amer. Chem. Soc.*, 67 (1945), No. 7, pp. 1065-1069, illus. 3).—Iodine was found to react, in human serum albumin, only with the tyrosine groups. Urea was found to accelerate the rate of diiodotyrosine formation. The rate of iodination of the serum albumin and of pepsin was measured in an acetate buffer solution and in urea solution, not all of the tyrosine groups being reactive toward iodine in the acetate buffer solution. In the presence of urea, some, though not all, of the non-reacting tyrosine groups became reactive. When both heat and urea were used as denaturing agents, all tyrosine groups became available for iodination. From the kinetic data, a computation of the number of free tyrosine groups in pepsin and in serum albumin was made.

Isolation of betaine from guayule, C. W. MURRAY and E. D. WALTER. (U. S. D. A.). (*Jour. Amer. Chem. Soc.*, 67 (1945), No. 8, p. 1422).—Because of the discard of much plant material in the processing of *Parthenium argentatum* for the isolation of the natural rubber content, the authors considered it important to ascertain if useful substances can be recovered from such wastes. They point out also the possibility that nonrubber constituents of the shrub may affect the quality of the rubber.

From the water soluble fraction of the leaves and from the defoliated shrub, betaine was isolated as the hydrochloride in yields of about 0.9 percent and 0.4 to 0.5 percent, respectively. The authors also isolated betaine from the acetone and benzene insoluble fraction of guayule rubber, thus proving the presence of betaine in the crude pebble-milled rubber. Betaine was also obtained from the product of each step in the extraction of the rubber, such as the dispersion prepared by cutting or comminuting the shrub in water and used for separation of rubber as latex, the solution obtained in parboiling of shrub to remove leaves, and the pebble mill slurry.

The extraction of fat and phosphorus from wheat starch, L. LEHRMAN (*Jour. Amer. Chem. Soc.*, 67 (1945), No. 9, pp. 1541-1542).—Extraction of raw and disintegrated wheat starch with methanol removed most of the fat and phosphorus. Extraction of disintegrated wheat starch with 80 percent dioxane-water solution (constant boiling mixture) removed all the fat but not all the phosphorus. It was therefore concluded that a small amount of the phosphorus was present not as a phospholipid, but possibly linked in some way with the starch. The extracted starch was more nearly free of phosphorus than any starch previously reported.

Reversible effect of stannic chloride on the rotation of starch dispersions, C. L. HOFFPAUIR and J. D. GUTHRIE. (U. S. D. A.). (*Jour. Amer. Chem. Soc.*, 67 (1945), No. 7, pp. 1225-1226, illus. 1).—The optical rotation of a dispersion of starch in a calcium chloride solution was found to be reduced appreciably by the addition of stannic chloride. The original optical rotation could be restored by the

addition either of uranyl acetate or of sodium acetate. A similar result was obtained by the addition of stannic chloride to a dispersion of glycogen. The laevorotation of inulin, on the other hand, was increased by the same addition. In view of the fact that stannic chloride is a protein precipitant in general use in a method for the determination of starch, the observations noted may be of practical as well as of theoretical importance.

Isolation and structure of an enzymatically synthesized crystalline disaccharide, D-glucosido-L-sorboside, W. Z. HASSID, M. DOUDOROFF, H. A. BARKER, and W. H. DORE. (Univ. Calif.). (*Jour. Amer. Chem. Soc.*, 67 (1945), No. 8, pp. 1394-1397, illus. 3).—A crystalline nonreducing disaccharide consisting of D-glucose and L-sorbose has been synthesized from glucose-1-phosphate and L-sorbose through the action of a phosphorylase from *Pseudomonas saccharophila*. Periodate oxidation data indicated that the glucose residue in the disaccharide possesses the pyranose, and the sorbose residue possesses the furanose configuration. Evidence indicating that both D-glucose and L-sorbose were joined through α -linkages was found. It is concluded that the disaccharide was probably α -D-glucopyranosido- α -L-sorbofuranoside.

Acetates, propionates, and butyrates of simple saccharides, I. A. WOLFF. (U. S. D. A.). (*Jour. Amer. Chem. Soc.*, 67 (1945), No. 9, pp. 1623-1624).—The author prepared 22 esters of saccharides and saccharide derivatives by acylation with the anhydride of the corresponding acid in pyridine, purifying the reaction product by vacuum distillation of the excess reactants and byproducts. He found that the sugar esters can be obtained in quantitative yield by concentration of the reaction mixture in vacuo after the esterification process is complete. The excess pyridine, anhydride, and fatty acid formed are removed, leaving the ester in a good state of purity. "Further appropriate purification procedures can then be applied if desired, depending on the properties of and intended uses for the particular ester. This method of operation has the following advantages: (1) Ease of operation with a minimum of manipulative steps, and (2) increased yields of esters in many cases. It is particularly useful as compared to the conventional procedure when the desired ester is moderately water soluble (e. g., levoglucosan triacetate)."

Catalytic air oxidation of methyl oleate and characterization of the polymers formed, D. SWERN, H. B. KNIGHT, J. T. SCANLAN, and W. C. AULT. (U. S. D. A.). (*Jour. Amer. Chem. Soc.*, 67 (1945), No. 7, pp. 1132-1135).—The authors studied the catalytic air oxidation of methyl oleate. The high-boiling, previously uncharacterized portion of the oxidation products obtained in 30 to 40 percent yield was fractionated by molecular distillation, yielding oxygenated polymers of dimeric and higher complexity. It is believed that these polymers are oxygen linked. A methyl ester fraction with a boiling point intermediate between that of methyl oleate and the polymers was isolated and extensively studied for the first time. By oxidative splitting of this fraction with potassium permanganate in acetone solution, it was shown to consist mainly of methyl esters of several isomeric monohydroxy derivatives of one or more mono-unsaturated acids in which the double bond was shifted from the 9,10-position, and methyl esters of dimeric acids.

Photochemical dimerization of n-butyl mesityl oxide oxalate, S. A. HALL, R. K. ADAMS, JR., and H. L. HALLER. (U. S. D. A.). (*Jour. Amer. Chem. Soc.*, 67 (1945), No. 7, pp. 1224-1225).—The n-butyl ester of mesityl oxide oxalic acid, patented under the trade name "Indalone," is used as an insect repellent to protect against the bites of mosquitoes and flies. The authors found that the exposure of thin films of this compound to ultraviolet light caused irreversible and quantitative polymerization of the liquid ester to a crystalline solid, m. p. 106°-107° [C.], which was identified as a dimer of Indalone. That this dimerization will take place completely in 3½ hr. on exposure of a thin layer to March sunlight, or in 1 hr. on

exposure to an ultraviolet lamp, is of special interest because of the loss in insect-repellent properties involved after dimerization.

Chemical reactivity of myosmine, P. G. GAINES, A. EISNER, and C. F. WOODWARD. (U. S. D. A.). (*Jour. Amer. Chem. Soc.*, 67 (1945), No. 8, pp. 1258-1262).—Having obtained myosmine, 2-(3-pyridyl)- Δ^2 -pyrroline, in fair yields by the pyrolysis of nicotine, the authors gave special attention in the investigation here noted to reduction products and to derivatives of 3-pyridyl- ω -aminopropyl ketone, the open chain hydrolytic product of myosmine.

It was shown that myosmine hydrolyzes readily to 3-pyridyl- ω -aminopropyl ketone in aqueous solution, whereas N-methylmyosmine is resistant to hydrolysis. Nor-nicotine, hexahydronornicotine, and octahydronornicotine were prepared by the reduction of myosmine and by confirmatory syntheses. 3-(1,4-Diaminobutyl)-pyridine, 3-(4-aminobutyl)-pyridine, and 2-(3-pyridyl)-3-(2-aminoethyl)-indole dihydrochloride were also prepared.

Acceleration by electrolytes of alkaline de-esterification of pectin, H. LINEWEAVER. (U. S. D. A.). (*Jour. Amer. Chem. Soc.*, 67 (1945), No. 8, pp. 1292-1293).—The effects of sodium, calcium, and magnesium chlorides on the rate of de-esterification of pectin by alkali in aqueous solution were studied, these electrolytes, and especially their cations, having been found to accelerate the rate of alkaline de-esterification of pectin as much as 400 percent. This acceleration contrasts with the small effect of electrolytes on the rate of hydrolysis of simple esters.

The results led to the interpretation that the negatively charged carboxyl groups of pectin are close enough to the ester bonds to interact with the hydroxyl ions as they approach the ester bonds. The salt decreased the interaction (repulsion). As has been found for the primary salt effect in other systems, the acceleration of de-esterification of pectin by salt reflected largely a change in the entropy of activation rather than in the energy of activation.

The enzyme activities of Pectinol A on pectin and other substances, V. B. FISH and R. B. DUSTMAN. (W. Va. Expt. Sta.). (*Jour. Amer. Chem. Soc.*, 67 (1945), No. 7, pp. 1155-1157).—A commercial enzyme preparation designated Pectinol A was found to contain about 91.5 percent sugar, principally dextrose and levulose. These sugars may be extracted with cold 80 percent ethanol, leaving an active sugar-free enzyme mixture. Using optical rotation and iodine reduction methods, the sugar-free Pectinol A was found to completely hydrolyze 10 times its weight of pectin to galacturonic acid in about 24 hr. at a temperature of from 37.5° to 40° [C.], while the pH of the reaction mixture changed from 3.6 to 2.8. The pectase activity of Pectinol A, Pectinol 100D, and two samples of sugar-free Pectinol A were found to be as follows: Pectinol A, 42; Pectinol 100D, 38.7; sugar-free Pectinol A₁ 47.0; and sugar-free Pectinol A₂ 30.6, all measured at 31° and pH 4.5. The optimal pH range for the pectase activity of these samples of Pectinol A was found to be from 4.3 to 4.6. It was found by optical rotation methods that sugar-free Pectinol A will bring about the hydrolysis of sucrose, starch, and maltose at 37.5° and pH 3.3. This enzyme showed only slight hydrolysis of inuline and gave no indication of hydrolysis of a suspension of xylan under these conditions.

Physical constants of methyl esters of commonly occurring fatty acids: Vapor pressure, P. M. ALTHOUSE and H. O. TRIEBOLD. (Pa. Expt. Sta.). (*Indus. and Engin. Chem. Analyt.*, Ed., 16 (1944), No. 10, pp. 605-606, illus. 2).—Methyl esters of caproic, caprylic, capric, lauric, myristic, palmitic, stearic, oleic, and linolic acids were obtained in a pure state by repeated fractional distillation. Vapor pressure curves and decomposition pressures and temperatures have been determined for each of the methyl esters. With the exception of the C₁₂ series, it was shown that an ester fraction can be identified and its purity ascertained by means of its vapor

pressure curve. With the aid of the decomposition data, it was possible to eliminate excess decomposition by controlling the pressure and hence the boiling temperature of fractional distillation.

Nicotinic acid: Water-insoluble esters and amides, C. O. BADGETT, R. C. PROVOST, JR., C. L. OGG, and C. F. WOODWARD. (U. S. D. A.). (*Jour. Amer. Chem. Soc.*, 67 (1945), No. 7, pp. 1135-1138).—The authors describe the preparation of 10 new esters and 13 new N-(n-alkyl) amides of nicotinic acid. Preliminary biological trials and determinations of the solubility data indicated that these new compounds may be suitable water-insoluble anti-pellagra materials for the fortification of food products which are rinsed prior to cooking. It is pointed out, however, that the actual value of the new compounds can be ascertained only by trials carried out under the conditions of their intended use.

Gossypol as a carotene-protecting antioxidant, in vivo and in vitro, E. L. HOVE. (Ala. Expt. Sta.). (*Jour. Biol. Chem.*, 156 (1944), No. 2, pp. 633-642, *illus.* 2).—Rats were fed a diet in which gossypol, dianilinogossypol, or α -tocopherol were given as 1 mg. daily supplements in addition to 2 γ of carotene and either 0.1 gm. of lard or 25 mg. ethyl linolate. Under the experimental conditions used, gossypol or cottonseed products containing this factor were nearly as effective as α -tocopherol as an antioxidant. Cottonseed oil meal was equal to wheat germ in stabilizing a carotene solution in ethyl oleate, in vitro. The significance of these findings is discussed in relation to the toxic effect of cottonseed oil meal or other cottonseed products.

The effect of temperature on the relative antioxidant activity of α -, β -, and γ -tocopherols and of gossypol, E. L. and Z. HOVE. (Ala. Expt. Sta.). (*Jour. Biol. Chem.*, 156 (1944), No. 2, pp. 623-632, *illus.* 2).—Employing the methods outlined above, the authors have studied the relative antioxidant activity of α -, β -, and γ -tocopherol as influenced by various temperatures ranging from 40° to 98° C.

"At low temperatures the three compounds showed approximately equal activity, while at elevated temperatures the γ -tocopherol was several times more active than the α form. This held true both for the protection of carotene against preformed fat peroxides and for the inhibition of peroxide formation in aerated ethyl oleate. . . .

"A distinction is pointed out between antioxidant potency and activity. Evidence was obtained that at physiological temperatures α -tocopherol had the greatest anti-oxidogenic potency, followed in order by β - and γ -tocopherols and gossypol."

Loss of furfural-yielding constituents from wheat straw on treatment with alcoholic and aqueous sodium hydroxide solutions, H. D. WEIHE and M. PHILLIPS (*Jour. Agr. Res. [U. S.]*, 72 (1946), No. 4, pp. 163-167).—In a study of the extent of the loss of furfural-yielding constituents at different stages in the isolation of the hemicelluloses of wheat straw, partial delignification of the straw with a 2-percent solution of sodium hydroxide in 50-percent ethanol caused a loss of furfural-yielding constituents which amounted to 7.79 percent of the total furfural. Wheat straw which had been partially delignified with a 2-percent solution of sodium hydroxide in 50-percent ethanol and then subjected to the successive action of cold 4-percent aqueous sodium hydroxide solution, cold 2-percent solution of sodium hydroxide in 50-percent ethanol, cold 4-percent aqueous sodium hydroxide solution, and finally boiling 4-percent aqueous sodium hydroxide solution, suffered little or no loss of furfural-yielding constituents.

A comparison of the chemical composition of diploid and tetraploid corn, G. H. ELLIS, L. F. RANDOLPH, and G. MATRONE. (U. S. D. A.). (*Jour. Agr. Res. [U. S.]*, 72 (1946), No. 3, pp. 123-130).—In certain stocks of corn (*Zea mays* L.), doubling the number of chromosomes was accompanied by an increase in the amount of nitrogen present in the grain and in the stover, the average increase being 15 percent in the grain and from 20 to 34 percent in the stover. The chemical com-

position of the grain in diploid and tetraploid maize was essentially the same with respect to ether extract, ash, and crude fiber. The diploid and tetraploid corn stover contained essentially the same relative amounts of ash, ether extract, and lignin. The higher crude protein ($N \times 6.25$) content of the tetraploid stover was accompanied by a correspondingly lower content of crude fiber and cellulose.

The changes in chemical composition that accompanied the transformation from diploidy to tetraploidy are assumed to be due to the cumulative action of certain genes, notably those concerned with protein metabolism, and the noncumulative action of other genes.

Comparative chemical studies on pea seed and canned soaked dry peas, V. B. BONNEY and H. FISCHBACH (*Jour. Assoc. Off. Agr. Chem.*, 28 (1945), No. 2, pp. 409-417, illus. 2).—No determinable invert sugar was found in the pea seed. All seed contained from 4.7 to 10.2 percent of sucrose. Appreciable proportions of the sugar, ash, and crude dextrin of the dry peas were leached out prior to canning; i.e., in the soaking and blanching phases. The drained liquor of the canned peas contained appreciable quantities of ash, protein, and sugar—more sugar than the drained peas. The pectic acid content of the drained canned peas did not differ sufficiently, among the varieties examined, to furnish a valuable objective test for varietal discrimination. Alcohol-insoluble solids, and the ratio of crude starch to protein, were found in much higher percentages in the Alaska peas than in any of the sweet, wrinkled varieties.

Lactic acid in dairy products.—IV, Effect of storage of evaporated milk on lactic and formic acid production, on pH, and on acidity and formol titrations, I. A. GOULD, E. WEAVER, and R. S. FRANTZ. (Mich. Expt. Sta.). (*Jour. Dairy Sci.*, 29 (1946), No. 1, pp. 33-40, illus. 4).—Preceding papers of this series (E. S. R., 94, p. 145) have dealt with microbiological changes and with effects of heat treatment at relatively high temperatures.

In the storage studies reported upon in the present paper, increases in lactic acid in evaporated milk stored at 35°, 70°, and 100° F. for 7 mo. averaged 1.1, 1.7, and 2.4 mg. per 100 gm., respectively. These small increases are considered to be, for all practical purposes, insignificant. Storage of the milk at 120° for 6 mo. resulted in an average lactic acid increase of 14.6 mg. per 100 gm., but at this time the milk had deteriorated far beyond the marketable stage. In an additional experiment in which evaporated milk was stored at 100° for 7 mo., lactic acid changes were again insignificant, but marked increases in titrable acidity and formic acid, accompanied by a decrease in pH, did occur. Titrations of oxalated samples indicated much larger acidity increases than were revealed by the standard titration procedure. Formol titrations were essentially unaffected by storage. Formic acid constituted a significant portion of the total acid produced in evaporated milk as a result of storage. Under the conditions of this experiment, and when the recovery of formic acid was corrected by retention, the increase in formic acid during storage was equivalent to 71.3 percent of the total acidity increase as determined by titration.

Limitations of the methods and possible applications of the findings are discussed.

Lactic acid in dairy products.—V, The accuracy of the Hillig method in determining lactic acid in heated milk, I. A. GOULD (*Michigan Sta. Quart. Bul.*, 28 (1945), No. 2, pp. 115-118).—This is a continuation of the series noted above. To determine if high temperature heat treatment interferes with the Hillig method of measuring lactic acid (E. S. R., 78, p. 447), milk was permitted to develop acidity, then was neutralized with disodium phosphate and heated in sealed cans for 1- and 2-hr. periods. Lactic acid determinations were made before and after heating.

The results showed that the lactic acid content of the milk before and after heating was only slightly different, the lactic acid being slightly higher in the heated milk as a result of the heat treatment. It is concluded that the accuracy of the

Hillig lactic acid method in measuring the lactic acid content of milk is not affected by subjecting the milk to high temperatures prior to the determination. These results are in agreement with previous findings (see preceding abstract), which showed that heat treatment of milk produces only small increases in lactic acid in comparison to the total acidity change created.

Preservative, chemical, and bacteriological effect by hypochlorite solution added to milk, G. H. GAUSER and W. H. KING (*Jour. Assoc. Off. Agr. Chem.*, 28 (1945), No. 2, pp. 417-424, illus. 4).—Experimenting upon a single lot of milk, the authors concluded that under the conditions of the experiments the addition of hypochlorite to fresh milk may appreciably reduce the bacteria count whether or not there is subsequent pasteurization, and that hypochlorites in quantities having little or no effect on flavor may exert a slight but definite preservative effect. More than 10 p. p. m. had to be added to the milk before the Rupp test became positive. Proper use of sterilizing solutions would not result in a positive Rupp test in market milk.

Low pressure-low temperature system for decomposition studies in food, H. FISCHBACH (*Jour. Assoc. Off. Agr. Chem.*, 28 (1945), No. 3, pp. 639-643, illus. 1).—A new technic for the study of decomposed foods, based on a low temperature-low pressure system with suitable chemical and cold traps, permitted separation of very weakly dissociated volatile bases (K as low as 10^{-10}) from those more strongly dissociated, together with separation of neutral volatiles, was possible in one operation. In like manner volatile acids could be separated from non-acidic material.

Experimental studies on decomposition of oysters used for canning, W. H. KING, F. F. FLYNN, and J. N. GOWANLOCH (*Jour. Assoc. Off. Agr. Chem.*, 28 (1945), No. 2, pp. 385-398, illus. 1).—A detailed report of a study of spoilage of raw and of canned oysters is accompanied by directions for a steam-distillation method for determining indole, this compound being extracted from the steam-distillate and determined by a modification of the usual *p*-dimethylaminobenzaldehyde test.

Persistence of monochloroacetic acid in wine, J. B. WILSON (*Jour. Assoc. Off. Agr. Chem.*, 28 (1945), No. 3, pp. 627-633).—It was found that monochloroacetic acid does not hydrolyze when added to wine at any point during the process of manufacture, and the quantities added remained unchanged even after 2 yr. of storage. When fermentable sugars were present, the addition of 0.01 percent of monochloroacetic acid did not prevent secondary fermentation of wine containing more than 12 percent of alcohol by volume, nor did the addition of 0.05 percent to wine containing less than 12 percent.

The chemical composition of technical DDT, H. L. HALLER, P. D. BARTLETT, N. L. DRAKE, M. S. NEWMAN, S. J. CRISTOL, C. M. EAKER, R. A. HAYES, G. W. KILMER, B. MAGERLEIN, G. P. MUELLER, A. SCHNEIDER, and W. WHEATLEY. (U. S. D. A., Univ. Md., Ohio State Col., et al.). (*Jour. Amer. Chem. Soc.*, 67 (1945), No. 9, pp. 1591-1602).—These authors report a study of the composition of several samples of technical DDT and a sample of "byproduct oil" recovered from a process of refinement of crude DDT prepared from "chlorinated alcohol" and chlorobenzene. Technical DDT was found to contain upward of 70 percent of 1-trichloro-2,2-bis-(*p*-chlorophenyl)-ethane (*p,p'*-DDT), the most active insecticidal ingredient. The major impurity is 1-trichloro-2-*o*-chlorophenyl-2-*p*-chlorophenylethane (*o,p'*-DDT). Lesser amounts of 12 other organic impurities were found, the presence of which may be explained on the basis of side reactions involving chloral, chlorobenzene, sulfuric acid, and impurities in the starting materials. Work on the proof of structure, including synthesis of the byproduct materials, is described. The synthesis of all the isomeric dichlorobenzophenones with one chlorine atom on each ring and of the 2,4-dinitrophenylhydrazones of these ketones is described.

Optical crystallographic properties of DDT, E. L. GOODEN. (U. S. D. A.). (*Jour. Amer. Chem. Soc.*, 67 (1945), No. 9, pp. 1616-1617).—The compound referred

to in this use of the term DDT is the purified single isomer, 1,1,1-trichloro-2,2-bis-(4-chlorophenyl)-ethane. The optical crystallographic characteristics observed are thus described: "Habit (from ethanol): needles or long prisms, more or less flattened, with elongation parallel to Y (vibration direction for β). Refractive indices (sodium light): α , 1.618; β , 1.626; γ , 1.755. Optical character positive, shown decisively both by refractive indices and by the selenite plate. Sign of elongation variable, depending on the position at which the rolling needle comes to rest, since the lengthwise apparent index is β and the other may be either above or below. Optic axial angle calculated from refractive indices, 30° [C.]; agrees with Bertrand lens measurements within normal observational error. Extinction, in general, parallel to crystal length; thorough study of extinction angles complicated by marked tendency to twinning. Crystal system probably orthorhombic; which is in agreement with X-ray diffraction evidence reported by others."

A kinetic study of the dehydrochlorination of substituted 2,2-diphenylchloroethanes related to DDT, S. J. CRISTOL. (U. S. D. A.). (*Jour. Amer. Chem. Soc.*, 67 (1945), No. 9, pp. 1494-1498, illus. 3).—This study concerns the dehydrochlorination with sodium hydroxide of 11 2,2-diarylchloroethanes related to DDT. The reactions were found to be of the second-order E_a type. The effects of changes in solvent and of increase from chloromethyl to dichloromethyl and trichloromethyl in one group of compounds were shown to be as predicted for the E_a type. The experimental values of reaction rate constants for eight diaryltrichloroethanes with para substituents were found to be in fair agreement with those predicted by theory. The scale of the deviations suggested, however, that there may be necessary a slight difference in treatment of disubstituted-diaryl derivatives as compared with monosubstituted-diaryl derivatives.

The rate constant for the *o,p'*-DDT isomer, which is the principal impurity in technical DDT, was shown to be 1/67 that of the *p,p'*-DDT isomer, which is the principal insecticidal agent.

sym-Tetraphenylethane from DDT and related compounds, E. E. FLECK, R. K. PRESTON, and H. L. HALLER. (U. S. D. A.). (*Jour. Amer. Chem. Soc.*, 67 (1945), No. 8, pp. 1419-1420).—In an investigation of the effect of various solvents upon the dehydrochlorination of 1,1,1-trichloro-2,2-bis(4-chlorophenyl)ethane ("DDT"), the authors observed an abnormal reaction with anhydrous aluminium chloride and benzene, one molecular equivalent of aluminium chloride in the presence of a large excess of benzene causing the evolution of approximately two equivalents of hydrogen chloride in a reaction which appeared to be of the Friedel-Crafts type. From an experiment, described in some detail, in which about a 10 percent yield of tetraphenylethane and unidentified colored substances were produced, it is concluded a number of competing reactions were involved. Several compounds related to DDT gave similar results.

Isolation of rutin from *Hydrangea paniculata*, var. *Grandiflora sieb.* J. F. COUCH and J. NAGHSKI. (U. S. D. A.). (*Jour. Amer. Chem. Soc.*, 67 (1945), No. 8, p. 1419).—This paper reports the isolation and identification of rutin 3,5,7,3',4'-pentahydroxyflavone-3-rutinoside in the flowers of a common garden species of *Hydrangea*. The presence of rutin in relatively large quantities in the flowers has not previously been reported.

Constituents of the insecticidal resin of the yam bean (*Pachyrhizus erosus*) L. B. NORTON and R. HANSBERRY. (N. Y. State Expt. Sta.). (*Jour. Amer. Chem. Soc.*, 67 (1945), No. 9, pp. 1609-1614, illus. 1).—The ether extract of yam beans was separated into a nontoxic oil and a resin toxic to insects. The resin, fractionated by chromatographic methods, yielded one noncrystalline and six crystalline compounds and three heterogeneous fractions. One of the crystalline compounds was identified as rotenone, and a second, designated "erosone," was shown to be closely related to

elliptone. Four of the compounds showed evidence of a relation to the rotenoid structure, but differed in containing a single methoxyl group. Three of the compounds and one of the heterogeneous fractions were toxic to the silkworm, but two of these compounds were of low toxicity to the Mexican bean beetle. The toxic heterogeneous fraction probably contained at least one toxic compound not isolated.

A simplified conductometric titration apparatus, E. M. BURAS, JR., and J. D. REM. (U. S. D. A.). (*Indus. and Engin. Chem. Analyt., Ed., 16 (1944), No. 9, p. 591, illus. 1*).—In a set-up considered by the authors to be one of the simplest available for such titrations, the voltage is adjusted to a constant value after each addition of titrating solution and the current passing through the conductivity cell is measured. By plotting milliliters of solution added against milliamperes, a typical conductometric curve is obtained. By the use of a constant-voltage transformer and an alternating-current milliammeter, the authors eliminated the adjustment of a fluctuating voltage with a potentiometer, reading this on a voltmeter, and simultaneously reading the milliammeter.

Washing Selas filtering crucibles by reverse flow, E. J. BENNE. (Mich. Expt. Sta.). (*Indus. and Engin. Chem., Analyt. Ed., 16 (1944), No. 4, pp. 277-278, illus. 1*).—To provide for the reversed-flow washing of the porous-bottom type of filtering crucible, the author fits the top of the reversed crucible into a circular groove in the top of a rubber stopper in a filter flask, and provides a reservoir for the washing liquid by fitting onto the bottom of the crucible a rubber pipette bulb cut at one end with a cork borer to fit the crucible and at the other end with scissors. It is noted that a short length of Gooch-crucible tubing would also serve this purpose. Some supplementary devices are indicated in a photograph reproduced with the note.

Device for rapid closing of weighing bottles, S. M. CHASTAIN. (U. S. D. A.). (*Indus. and Engin. Chem., Analyt. Ed., 16 (1944), No. 9, p. 579, illus. 2*).—The device here described and figured consists essentially of two plates, the upper holding the stoppers of a considerable number of bottles, the lower plate keeping the bottles in fixed positions. The top plate, by means of which all of the bottles are simultaneously opened or closed, is drilled at one end to fit a guide post fixed in a corresponding position in the lower plate. In the oven, the plates rest on the brackets designed to hold the oven shelves.

Apparatus for the determination of volatile citrus oils, E. T. BARTHOLOMEW and W. B. SINCLAIR. (Calif. Citrus Expt. Sta.). (*Jour. Assoc. Off. Agr. Chem., 28 (1945), No. 2, pp. 339-345, illus. 1*).—The apparatus here described and figured was found to reduce to a minimum opportunities for vaporized oil to escape, or for condensed oil to adhere to the condenser where it cannot be washed down. The condensed oil remained in a single small mass; it was not broken into droplets by the dripping effect of condensed liquids or by puffs of air originating in the distilling flask. The apparatus was so constructed that puffs of air did not tend to drive the condensed oil down into the water in the receiving flask, or to evaporate it. The calibrated measuring tube was long enough so that comparatively large amounts of oil, as well as small amounts, could be measured accurately. All inner walls of the apparatus were readily accessible for cleaning. Results of determinations of volatile oils in samples of lemon peel were presented to demonstrate the usefulness and accuracy of the apparatus.

Elimination of nitrate impurities from 30 percent hydrogen peroxide, E. C. CANTINO. (Univ. Calif.). (*Indus. and Engin. Chem., Analyt. Ed., 16 (1944), No. 3, pp. 181-182, illus. 1*).—The author finds the available hydrogen peroxide of 30 percent strength to contain about 200 p. p. m. of nitrate, and distillation under reduced pressure to reduce the peroxide content to a concentration seldom over 20 percent. Removal of the greater part of the nitrate impurity could be effected, however, by drawing the reagent through suitably separated layers of an activated carbon. A

water-cooled adsorption column was found to be required for the purification. A suitable apparatus is described and figured. This column is represented as 3 cm. in diameter, 45 cm. long in its water-jacketed portion, with additional head and foot-space, and packed loosely with 5- to 10-gm. portions of a specified commercial type of activated carbon separated by layers of glass beads, glass-wool plugs, and perforated porcelain plates. In an apparatus of the form and dimensions specified, a percolation rate of 200 cc. per minute was the most effective. A charge of 35 gm. of the activated carbon sufficed for the purification of more than 500 cc. of the peroxide reagent. The nitrate content was reduced to less than 10 p. p. m., and the concentration of the purified reagent was about 27 to 29 percent, which was found sufficient for the oxidation of the organic matter of plant tissue of which the nitrate content was to be determined.

Working with the microscope, J. D. CORRINGTON (*New York and London: McGraw-Hill Book Co., 1941, pp. 418+*, *illus. 121*).—The author notes that most books on microtechnic are either "rankly juvenile and unscientific . . . or they are highly professional and technical, designed for the upper collegiate level, and presupposing some classroom supervision." Stressing the need of the serious amateur for a more suitable book, the author announces his purpose as to provide "a graded series of exercises in the mounting of materials for observation under the microscope. Beginning with the simplest and proceeding by easy stages to advanced operations, the explanations have been made as detailed and nontechnical as possible." In accordance with this purpose, the treatment of the technic of the microscope itself is rudimentary, but the preparation exercises grade upward to highly skilled technics. The book also contains useful hints on finding and identifying botanical and zoological material and clear directions for dissecting out required parts, usually neglected in manuals of microtechnic.

The contents are, in part: The microscope; temporary mounts for immediate study; simple balsam mounts; procedures in microtechnic; processed balsam mounts; cell mounts; stained whole mounts; smear preparations; bacteria; microscopic skeletons, grinding hard objects; sectioning—manual and freezing methods, celloidin method, and paraffin method; the newer technics; special preparations; preparation and use of reagents; sources of supplies; literature of microtechnic; reference tables; and index.

Anilin oil-methylene blue stain for the direct microscopic count of bacteria in dried milk and dried eggs, W. R. NORTH (*Jour. Assoc. Off. Agr. Chem., 28 (1945), No. 2, pp. 424-426*).—The staining of smears with a staining reagent made up of 3 cc. of aniline, 10 cc. of 95 percent alcohol, 1.5 cc. of hydrochloric acid added slowly to the alcoholic aniline solution, 30 cc. of saturated alcoholic solution of methylene blue, and water sufficient to make a total volume of 100 cc., resulted in deeply stained organisms and a very pale blue background. The numbers counted were very much higher than those found by the use of the 1 percent alcoholic methylene blue without acid or aniline, and exceptionally close agreement among the counts made by several observers was obtained.

Color measurement and its application to the grading of agricultural products: A handbook on the method of disk colorimetry, D. NICKERSON. (*U. S. Dept. Agr., Misc. Pub. 580 (1946), pp. 62+*, *illus. 47*).—This publication is intended (1) as a general introduction to the subject of color measurement, especially in its application to grading work (as in the grading of food products of various types, and of cotton, hay, etc.), and (2) as a handbook of the special method of disk colorimetry (E. S. R., 62, p. 503) in its various forms. Abundant references to original papers and standard works are given, "in order that students who care to do so may become familiar with a general background of authoritative information on problems involving color measurement and specification." Following the very brief introduction, the contents

are: Color-grading problems; color charts in grading work; transparent-color standards in grading work; standards need measuring; several methods of expressing results of color measurement (International Commission on Illumination method of color notation, homogeneous-heterogeneous method of color notation, Munsell method of color notation, and relation between methods); disk colorimetry (early method, present method, instruments, choice of disks, and conversion to Munsell notation); application of disk colorimetry to grading problems (sample preparation and preparation of conversion data); applications of Munsell notations in related problems; the Kelly mask method for color matching; standard names for colors; American Standards Association standard for the specification and description of color; color-tolerance specifications; artificial daylighting for grading work; color-vision testing; and literature cited.

Fluorimetry: The estimation of the concentration of fluorescent pigments from their fluorescence intensity, P. ELLINGER and M. HOLDEN (*Jour. Soc. Chem. Indus., Trans. and Commun.*, 63 (1944), No. 4, pp. 115-121, illus. 6).—A detailed discussion is presented on the principles of fluorimetric determinations, including the relative accuracy of various methods, influence of concentration of the solution, position and shape of the container, intensity and absorption of the primary light beam, and various other factors. Both direct deflection and balancing methods were used. The solutions studied included thiochrome, chlorophyll, uranine, riboflavin, and quinine sulfate in various solvents.

Accelerated method for determining moisture absorption, J. Y. YEE and R. O. E. DAVIS. (U. S. D. A.). (*Indus. and Engin. Chem. Analyt. Ed.*, 16 (1944), No. 8, pp. 487-490, illus. 4).—The authors point out that the ordinary procedure, consisting essentially in exposing the samples in weighing bottles or on watch glasses in an enclosed space over a solution designed to give the desired relative humidity, usually produces results neither consistent nor reproducible. An accelerated method for the moisture-absorption measurements is described, one of the essential features of which consists in the use of a humidifying chamber provided with a four-bladed aluminum fan rotating in a plane parallel with the surface of the humidity-standard liquid and directly over it. Factors such as temperature, the size, depth, and number of dishes, and the arrangement in the humidity chamber were found to influence the final results. Careful standardization of all conditions, therefore, is essential in order to obtain reproducible results. Devices introduced for this purpose include sample dishes and covers of standardized form and size, an instrument for the uniform spreading of the sample dish, and a leveling device, designed to be placed on the sample under an additional weight of 1 kg., to give the sample a uniformly smooth surface and uniform packing. Considerable time can be saved by the accelerated method in making equilibrium moisture-absorption measurements of fertilizers.

Determination of large amounts of manganese: Modified persulfate method, H. D. HILLSON. (Univ. Maine). (*Indus. and Engin. Chem. Analyt. Ed.*, 16 (1944), No. 9, pp. 560-562).—In a study of the reaction of ammonium persulfate with manganous salts in acid solution, it was discovered that by the addition of disodium hydrogen phosphate, the manganese can be oxidized and the excess persulfate decomposed by boiling. By the use of osmic acid, the permanganate may be stoichiometrically titrated with sodium arsenite solution. These modifications adapt the persulfate method to the accurate determination of manganese in concentrations larger than it has been possible heretofore to deal with and extend the usefulness of the procedure. A further necessary modification consisted in the establishment of carefully specified conditions for the heating by which the excess persulfate is decomposed, such that removal of the persulfate is complete without concomitant decomposition of any of the permanganate. Full manipulative detail of the determination is given.

Some checks on methods and solutions used in the analysis of fertilizers, H. R. ALLEN. (Ky. Expt. Sta.). (*Jour. Assoc. Off. Agr. Chem.*, 28 (1945), No. 2, pp. 345-351).—Averages of results of analyses of the Magruder check samples showed that the overall variations between different analysts are too great. Procedures for checking nitrogen, phosphoric acid, and potash determinations on standard samples are given, and reasons for some variations in results are stated. Advantages of using the normality of the standard alkali as determined by titration in the same buret used in the routine nitrogen determination are pointed out. It was shown by analysis of standard samples that high results may be obtained with the A. O. A. C. volumetric method for phosphoric acid when sulfuric acid is used for solution of sample. Differences of about 1 percent potassium oxide could be obtained in analysis of reagent grade potassium chloride by varying the strength of the alcohol from 80 to 95 percent and by varying the amount of washing. An acid alcohol prepared with 84 percent alcohol and 84 percent washing gave theoretical results. A procedure for preparing the neutral ammonium citrate solution at the prevailing room temperature by determining the ammonia and citric acid contents is given. This served to standardize the hydrometer at this same temperature.

Titrimetric determination of the neutralization value of calcium silicate slags, W. M. SHAW. (Tenn. Expt. Sta.). (*Jour. Assoc. Off. Agr. Chem.*, 28 (1945), No. 2, pp. 310-335, illus. 6).—Solution of 0.5 gm. samples of blast furnace slags was found to be effected by boiling 5 min. in 35 cc. of 0.5 N acid; but 25 cc. of such acid, though containing 30 percent in excess of the acid required by the calcium and magnesium content of most slag samples, failed to effect solution of samples of a high aluminum content even when the digestion was prolonged. Titration curves for solutions of calcium silicate, containing aluminum chloride, demonstrated that the equivalence pH is governed by the ratio of $\text{SiO}_2:\text{Al}_2\text{O}_3$ in the titrated system. In general, the equivalence pH of the blast furnace slag solutions fell within the range of pH 4.8-pH 5.4. Fluorine content was the chief cause of irregularity in the titration curves for phosphate furnace slags, the equivalence pH of which developed in the region between pH 6 and 8, wherein the aluminosilicate precipitate exerted considerable cation sorption. Phenolphthalein gave an error of about -6 percent in the slag titrations, methyl orange an error of +6 to +24 percent. Titration to pH 5.2 with bromocresol green gave only approximate values. Undissolved matter and precipitates formed during titration impaired the clarity of indicator end-point observation.

Two procedures are proposed to obviate both direct titration, technic and complete analysis of slags. One procedure directs the dissolution of the slag in acetic acid, dehydration of silica and its elimination jointly with R_2O_3 , evaporation of the acetate solution, ignition, and titration of the resultant calcine. The other prescribes dissolution in hydrochloric acid, joint elimination of silica and R_2O_3 , evaporation of filtrate with nitric acid, oxalate precipitation and ignition, and titration of the calcine. The first-mentioned procedure was found especially applicable to slags that contain fluorides and phosphates, and to slags in general when complete acetic acid dissolution of the charge is effected. The last-mentioned procedure was found appropriate for slags devoid of fluorides and phosphates.

Further studies of the molybdenum blue reaction, R. E. KITSON and M. G. MELLON. (Purdue Univ.). (*Indus. and Engin. Chem., Analyt. Ed.*, 26 (1944), No. 7, pp. 466-469, illus. 3).—As a result of a spectrophotometric study of the determination of phosphorus, a modified A. O. A. C. procedure is presented. The new procedure was found to give solutions of greater color stability and of equal color intensity. The work included a determination of the effects of the following variables: Reagent concentration, temperature of color development, order of addition of reagents, phosphorus concentration, and 60 diverse ions.

Application of a modified red-color test for rotenone and related compounds to *Derris* and *Lonchocarpus*, M. A. JONES. (P. R. Fed. Expt. Sta.). (*Jour. Assoc. Off. Agr. Chem.*, 28 (1945), No. 2, pp. 352-359, illus. 1).—The author describes modifications of the red-color test for rotenone and related compounds present in samples of plant material. The analysis of mixed plant extracts by differential spectrophotometric analysis of the red-color test was found impracticable. The ratio of rotenone content to red-color value as observed in root samples of *Derris* and *Lonchocarpus* was measured. The applicability of the red-color test to the analysis of small samples and in plant selection is discussed.

Determination of thiocyanate nitrogen in organic thiocyanates and mixtures, J. W. ELMORE. (*Jour. Assoc. Off. Agr. Chem.*, 28 (1945), No. 2, pp. 363-371).—For the analysis of insecticidal sprays and dusts containing organic thiocyanates, the author proposes a method consisting essentially in the decomposition of the organic combination by treatment with an aqueous sodium polysulfide solution at 70° C., separation of the thiocyanate radical as cuprous thiocyanate, and determination of the nitrogen content of this copper salt by the Kjeldahl method, the percentage of the organic thiocyanate being calculated from the thiocyanate nitrogen.

Determination of carbon-linked methyl groups, W. F. BARTHEL and F. B. LAForge. (U. S. D. A.). (*Indus. and Engin. Chem., Analyt. Ed.*, 16 (1944), No. 7, pp. 434-435, illus. 1).—The terminal-methyl determination of Pregl for carbon-linked methyl groups was modified for more rapid determinations. The terminal-methyl number, or the number of mole equivalents of acetic acid produced from a mole equivalent of substance, was determined for certain reference compounds. Detailed dimension specifications for the refluxing and distillation apparatus to be used are shown in a diagrammatic drawing.

Determination of citric acid in fermentation media and biological materials, D. PERLMAN, H. A. LARDY, and M. J. JOHNSON. (Wis. Expt. Sta.). (*Indus. and Engin. Chem., Analyt. Ed.*, 16 (1944), No. 8, pp. 515-516).—The authors modified the method of Pucher, Sherman, and Vickery (E. S. R., 76, p. 585) to obtain greater rapidity without sacrifice of the accuracy of the original procedure. The altered technic was found to be satisfactorily adapted to the determination of the citric acid content of fermented media and of tissue extracts.

Quantitative determination of extractable gossypol in cottonseed and cottonseed meal: A spectrophotometric method, C. H. BOATNER, M. CARAVELLA, and L. KYAME. (U. S. D. A.). (*Indus. and Engin. Chem., Analyt. Ed.*, 16 (1944), No. 9, pp. 566-572, illus. 4).—The authors point out that the reaction of gossypol with antimony trichloride in ether and chloroform extracts of cottonseed is specific and the reaction product is sufficiently stable to permit accurate spectrophotometric determination of the gossypol concentration of such extracts. A rapid direct method for determination of free gossypol in cottonseed is reported, the gossypol being extracted by equilibrating ground cottonseed and chloroform, treating the extract with concentrated hydrochloric acid, and applying the antimony trichloride reaction directly to the treated extract.

Investigations of amino acids, peptides, and proteins, XVIII-XX (Univ. Calif. et al.). (*Jour. Biol. Chem.*, 156 (1944), No. 2, pp. 703-724, illus. 22; 157 (1945), No. 1, pp. 387-394).

XVIII. *The amino acid requirements of Leuconostoc mesenteroides* P-60, M. S. Dunn, S. Shankman, M. N. Camien, W. Frankl, and L. B. Rockland (pp. 703-713).—Continuing the investigations of Dunn et al. (E. S. R., 93, p. 677) on the use of micro-organisms in the assay of amino acids, the authors have studied the nutritional requirements of *L. mesenteroides* P-60. In the basal medium tested, 21 amino acids were substituted for the casein hydrolysate fraction. Varying concentrations of these amino acids were tried in an attempt to determine the optimum concentration

needed. Preliminary results indicated that alanine, hydroxyproline, norleucine, and norvaline were nonessential or auxiliary growth substances. From the standard curves obtained from these experiments, the authors conclude that the method might be useful in the assay of a number of amino acids.

XIX. *The determination of lysine in protein hydrolysates by a microbiological method*, M. S. Dunn, M. N. Camien, S. Shankman, W. Frankl, and L. B. Rockland (pp. 715-724).—The method described above has been applied to the assay of 1(+)-lysine in protein hydrolysates. Casein and silk fibroin were found to contain 8.3 and 0.6 percent, respectively, of lysine. Comparisons of these data with values obtained by other methods of assay are made, and the relative accuracies of the various methods are discussed. The authors consider this method to give results of satisfactory precision and accuracy.

XX. *The determination of apparent free tryptophan in blood by a microbiological method*, M. S. Dunn, H. F. Schott, W. Frankl, and L. B. Rockland (pp. 387-394).—Based upon the *Lactobacillus arabinosus* assay for nicotinic acid of Snell and Wright (E. S. R., 87, p. 12), a method has been devised for the determination of tryptophan in tungstic acid filtrates of blood fractions.

Results indicate that the apparent free tryptophan content of human blood fractions averages 1.21 mg. percent for serum (5 samples), 1.14 mg. percent for plasma (10 samples), and approximately one-fifth of these values for blood cells. The apparent free tryptophan content of plasma or serum is considered to be approximately 1 percent of the total tryptophan content of serum.

The authors conclude tentatively that "the tryptophan values for plasma and serum are correct in order of magnitude and may be accurate to within about 10 percent."

Separation of amylose and amylopectin by certain nitroparaffins, R. L. WHISTLER and G. E. HILBERT. (U. S. D. A.). (*Jour. Amer. Chem. Soc.*, 67 (1945), No. 7, pp. 1161-1165).—In addition to alcohols, representatives of many different classes of organic compounds such as esters, ketones, mercaptans, carboxylic acids, nitroparaffins, and pyridine, which are capable of forming hydrogen bonds with amylose, were found to form complexes with this carbohydrate and can serve as agents for fractionating starch.

"Crystalline" amylose-nitroparaffin complexes were formed when starches were fractionated with nitroethane, 1-nitropropane, and 2-nitropropane. The yields of amylose, using 1-nitropropane and 2-nitropropane as fractionating agents, from cornstarch, potato starch, tapioca starch, and wheat starch are about the same as those obtained using butanol. Some of the properties of amylose-nitroparaffin complexes are described. The X-ray diffraction patterns of the three nitroparaffin complexes were identical. The amylose fractions were characterized by potentiometric iodine titration, retrogradation, and the film-forming properties of the triacetate derivative.

Determination of dextrose, levulose, invert sugar, and sucrose-invert sugar mixtures by copper reduction, using citrate-carbonate reagent, R. F. JACKSON and E. J. McDONALD (*Jour. Assoc. Off. Agr. Chem.*, 28 (1945), No. 2, pp. 371-385, illus. 4).—In general, and in harmony with previous experience with the carbonate method, it is concluded that this method is inferior in respect of precision to the methods in which caustic alkali is a constituent of the copper reagent. It is, however, valuable, because of its convenience for rapid work that does not require a precision greater than 0.5 percent. It is particularly useful to those who make only occasional analyses, since if care is taken to preserve the standard iodate solution no further standardization is required.

An observation of possible value for sugar determinations, D. L. MORRIS (*Indus. and Engin. Chem., Analyt. Ed.*, 16 (1944), No. 8, p. 537).—In adapting for use in micro-determinations of glucose a copper sulfate + sodium acefate reagent,

the author added potassium iodide. He found that when this iodide-containing reagent was heated with a glucose solution a precipitate which could be identified as cuprous iodide was formed, and that the speed of the reduction reaction was increased. The cuprous iodide precipitate could be determined either iodometrically in the solution or by separating and weighing the cuprous iodide directly. The weight of the cuprous iodide precipitate was shown to be of the order of 10 times that of the glucose oxidized. The possible value of this observation in the determination of sugars is pointed out.

Quantitative method for determination of maltose in the presence of glucose, H. H. BROWNE. (U. S. D. A.). (*Indus. and Engin. Chem., Analyt. Ed.*, 16 (1944), No. 9, pp. 582-583).—The authors base a polarimetric method on the fact that the optical rotation of glucose may be reduced to zero by addition of a sufficient quantity of soluble bisulfite, but the rotation of maltose and dextrins is affected only very slightly. The rotation of lactose and other reducing sugars is also lowered by the presence of bisulfites, and the rotation of the sugar alcohols is unaffected. The speed and accuracy of this method are comparable with those of polarimetric determinations in general, but the sensitiveness is somewhat less.

To establish a graph from which the maltose percentages could be read or determined by multiplying the polarimeter readings by the tangent of the line, the authors prepared a series of seven solutions, each solution containing 10 gm. of total sugar and not less than 75 cc. of water. The proportion of glucose to maltose was 10 gm. to 0, 8 to 2, 6 to 4, 5 to 5, 4 to 6, 2 to 8, and 0 to 10. To each of seven sugar flasks graduated to 110 cc. were added 30 gm. of sodium metabisulfite or its equivalent of sodium bisulfite, and one of the sugar solutions was transferred to each. The flasks were shaken to dissolve the metabisulfite, cooled at 20° C., the contents made up to a volume of 110 cc. with distilled water, mixed, and polarized at 20°. The length of the polariscope tube did not need to be specified, but had to be the same for all determinations. The observed rotations were then plotted against the percentage of maltose and lay practically on a straight line defined by these points. The percentage of maltose present could be determined by referring the readings to the graph or by multiplying (° S.) by the tangent of the line, in the experiments here reported.

Separation and identification of the volatile saturated fatty acids (C₁ to C₈), L. L. RAMSEY and W. I. PATTERSON (*Jour. Assoc. Off. Agr. Chem.*, 28 (1945), No. 3, pp. 644-656, illus. 5).—The volatile acids are separated on a chromatographic partition column of silicic acid, saturated with an aqueous solution of a suitable indicator, using butanol-chloroform as the second solvent. Formic, acetic, and propionic acids are separated completely from one another, but *n*-butyric and isobutyric acids are obtained together, although free of their homologs. Positive identification of all the acids except isobutyric is based upon the microscopic examination of a characteristic crystalline salt. Identification of isobutyric acid is based upon its oxidation to acetone by acid potassium permanganate.

Determination and detection of dichloroacetic acid in food products, C. F. BRUENING (*Jour. Assoc. Off. Agr. Chem.*, 28 (1945), No. 3, pp. 620-627).—A method designed for application to food products consisted essentially in extracting the acid with ether, converting the organically combined chlorine to the ionic condition by ignition of the extract with sodium carbonate or by hydrolysis with alcoholic potassium hydroxide solution, and Volhardt titration of the resulting soluble chloride.

Determination of 2,3-butylene glycol in fermentations, M. J. JOHNSON. (Wis. Expt. Sta.). (*Indus. and Engin. Chem., Analyt. Ed.*, 16 (1944), No. 10, pp. 626-627).—The butylene glycol was separated from the culture by continuous extraction with ether, water was added to the extract, the ether was evaporated, and the glycol was oxidized to acetaldehyde by boiling with periodate and dilute sulfuric acid. The

acetaldehyde was absorbed in a standard bisulfite solution, and the excess bisulfite was determined iodometrically. There was little interference from constituents of culture media. From 2 to 10 mg. of butylene glycol were required.

Extraction and estimation of carotene from foodstuffs, V. H. BOOTH (*Jour. Soc. Chem. Indus., Trans. and Commun.*, 64 (1945), No. 6, pp. 162-169, illus. 4).—A detailed description is given of the method evolved to eliminate many of the difficulties still present in the determination of carotene in foodstuffs. A discussion is included of the other methods used, the modifications tried, or sources of error introduced (47 references are listed). The method is recommended by the author for its simplicity, accuracy, speed, and avoidance of emulsion. "No distinction is made between α -, β -, and γ -carotenes, but lycopene, kryptoxanthin, and carotenoid esters are eliminable." Emphasis is laid on: (1) The minimization of mechanical damage by the rapid extraction of the sample by maceration with quartz under a solution of 3 : 2 light petroleum-acetone containing 0.1 percent quinol; (2) the removal of water-soluble substances by continuous washing (in an apparatus described and illustrated); (3) the removal of unwanted pigments by one of two methods (a) chromatographic adsorption on a specially prepared aluminium oxide-anhydrous sodium sulfate mixture followed by elution with 1.2 percent acetone in light-petroleum ether, or (b) extraction of the washed solution by diacetonol alone, or, following cold saponification, with a mixture of propanol and methanol and saturated aqueous potassium hydroxide.

Comparative tests with various other methods leads the author to state "this method gives higher results than a typical alkaline digestion method. The destructive effect of hot alkali is proved. Higher values than those in the literature are obtained for carrots and for grass. Recovery tests yield an average of 98.7 percent. Accuracy and recovery tests have an average coefficient of variation of 1.5. Both esters and lycopene are excludable. Eighteen estimations can be completed in an 8-hr. day."

Determination of carotene in dehydrated alfalfa: A simplified method, R. E. SILKER, W. G. SCHRENK, and H. H. KING. (*Kans. Expt. Sta.*). (*Indus. and Engin. Chem., Analyt. Ed.*, 16 (1944), No. 8, pp. 513-515).—In a procedure which combined much improved simplicity and rapidity with an accuracy equal to or better than that of other methods with which it was compared, a simplified method was developed for the determination of carotene in dehydrated alfalfa. The finely ground alfalfa was allowed to stand for 16 to 18 hr. in a mixture of acetone and a commercial light-petroleum solvent, the extract was concentrated on a steam bath to remove the acetone, the pigments were adsorbed by drawing the mixture through a magnesia column, and the carotene was then eluted with a 4 percent solution of acetone in the light-petroleum solvent above specified. Refluxing and phasic separations were avoided, and many more samples could be handled per day than by other methods in common use.

Simplified procedure for estimation of total carotenoids in carrots, V. H. BOOTH (*Jour. Soc. Chem. Indus., Trans. and Commun.*, 64 (1945), No. 7, pp. 194-196, illus. 3).—A detailed illustrated description is given of two methods used in obtaining small representative samples from carrots. Narrow disks are cut at several levels of the carrot, and small sectors are removed from each disk; or small holes are bored diagonally through the carrot at different levels, and the cylinders removed and analyzed.

The above assay method has been adapted and simplified for measuring total carotenoids in carrots. The author bases his modification on the assumption that, in mature carrots, carotene ($\alpha + \beta$ and other isomerides) approximates 90 percent of the total carotenoids. The carrot samples are ground with quartz in a 3 : 2 light petroleum-acetone solution. If the extract solution is clear, it may be used directly in a photometer where the reading obtained corresponds to the total amount of carotenoids present.

A method for estimating total fat-soluble antioxidants based on the relation between fat peroxides and carotene destruction, E. L. and Z. HOVE. (Ala. Expt. Sta.). (*Jour. Biol. Chem.*, 156 (1944), No. 2, pp. 611-621, illus. 2).—This method, developed for estimating total fat-soluble antioxidants, is based upon the protection of carotene against preformed fat peroxides. Best results were obtained when a concentration equivalent to 160 gm. per liter of peroxidized peanut oil in Skellysolve E and a carotene concentration of 1.2 mg. per liter were used.

Tests with α -, β -, and γ -tocopherols, or mixtures of the three, and gossypol, showed them all to be essentially equivalent in protecting carotene against preformed fat peroxides. Cholesterol and lecithin were inactive. Dry yeast and rat liver, as well as peanut, cottonseed, soybean, and corn oils, also were tested for their antioxidant activity.

Polarographic determination of vitamin C in fruits and vegetables, W. S. GILLAM. (Ind. Expt. Sta.). (*Indus. and Engin. Chem., Analyt. Ed.*, 17 (1945), No. 4, pp. 217-221, illus. 4).—Advantages of the described polarographic method are listed as follows: After initial calibration, no standardization of solutions is necessary; if oxalic acid is the extracting agent, all solutions used are relatively stable; no pretreatment of the extract is needed; and neither suspended matter nor colored substances will normally interfere with the reaction.

Diffusion current constants, half-wave potentials, and diffusion coefficients were calculated for the four supporting electrolytes used: (1) Potassium biphthalate buffer and oxalic acid; (2) phosphate buffer in metaphosphoric acid; (3) biphthalate buffer and oxalic acid in alcohol; and (4) biphthalate buffer in metaphosphoric acid.

Vitamin C values ranging from 4 to 85 μ g. per cubic centimeter of solution could be measured with an accuracy estimated as 3.3 to 4.3 percent.

Assays on various citrus fruits, tomatoes, fresh vegetables, dehydrated carrots, potatoes, and onions were compared with results obtained by three other methods—visual titration, photometric using 2,6-dichlorophenolindophenol, or Roe and Oesterling's 2,4-dinitrophenylhydrazine method (E. S. R., 93, p. 537). Difficulties occurred in the assays of some of the dehydrated products. In general, results obtained by the polarographic method were lower than those obtained by both the visual titration or phenylhydrazine methods. In the latter case, this difference could not be accounted for by the presence of dehydroascorbic acid.

New colorimetric reaction of vitamins D₂ and D₃ and their provitamins, A. E. SOBEL, A. M. MAYER, and B. KRAMER (*Indus. and Engin. Chem., Analyt. Ed.*, 17 (1945), No. 3, pp. 160-165, illus. 5).—A new colorimetric reaction of vitamins D₂ and D₃ has been studied spectrographically and described and illustrated in detail. This reaction occurs when glycerol dichlorohydrin or related compounds are added in the presence of acetyl chloride or other acid halides. "With calciferol an immediate yellow color is formed which turns green in 1 min., reaches a maximum in 15 min., and remains stable at 625 m μ for several hours. With ergosterol a weak pink color is observed immediately, which turns to orange in 15 to 20 min. and later to a fluorescent green. With 7-dehydrocholesterol no color is observed for several minutes; then a faint pink color appears, which becomes more intense in 24 hr. No color is produced with cholesterol. Under conditions suitable for quantitative estimations at 625 m μ , ergosterol has less than 4 percent and 7-dehydrocholesterol less than 0.3 percent of the absorption produced by vitamins D₂ and D₃. Cholesterol has no absorption. Conditions have been developed for differentiating vitamins D₂ and D₃ from ergosterol and 7-dehydrocholesterol, ergosterol from 7-dehydrocholesterol, and the dinitrobenzoate esters of these compounds from the free sterols."

Modified extraction procedures for use with certain foodstuffs in the estimation of vitamin-B₁ by the thiochrome method, Y. L. WANG (*Jour. Soc. Chem.*

Indus., Trans. and Commun., 64 (1945), No. 7, p. 220).—Further modifications of the Harris and Wang thiochrome method (E. S. R., 87, p. 762) are described for use with dried egg, meat, and plain, fortified, or milk chocolate. With the dried egg powder, a preliminary removal of fat is required, followed by digestion at pH 4 with papain and takadiastase or at pH 1.5–2.0 with pepsin and takadiastase. With fresh, cooked, or dried meat, acidification with 0.1 N HCl precedes heating on a water bath; then, after cooling to 40°–50° C., NaCl is added to induce precipitation and the pH is adjusted to 4.0, and digestion by takadiastase and papain is carried out. Slight modifications of the above treatment are used for the chocolate analyses.

Determination of thiamine by the thiochrome method—effects of temperature and dissolved oxygen on fluorescence of quinine standard and of thiochrome, D. F. CLAUSEN and R. E. BROWN (*Indus. and Engin. Chem., Analyt. Ed.*, 16 (1944), No. 9, pp. 572–574, *illus.* 2).—It is recommended that all solutions be brought to room temperature before reading. Because of the heat which may be produced by the instrument, the authors suggest that the quinine standard be removed from the instrument when not in actual use as the temperature changes thus produced could exert an appreciable effect upon the fluorometric readings.

The chemical estimation of α -tocopherol and total tocopherol in mixtures of the α , β , and γ forms, E. L. and Z. HOVE. (Ala. Expt. Sta.). (*Jour. Biol. Chem.*, 156 (1944), No. 2, pp. 601–610, *illus.* 3).—The authors have modified the procedures of Hines and Mattill (E. S. R., 90, p. 440) and of Parker and McFarlane (E. S. R., 86, p. 443) in developing a method capable of determining α -tocopherol in the presence of β - and γ -tocopherols. By specifically regulating the concentrations of the reagents (α , α' -bipyridine and ferric chloride) and carefully controlling the temperatures at 35° and 15° C., readings made at regular intervals over a 15-min. period can be used to estimate α -tocopherol (by difference). Peanut, cottonseed, soybean, corn, and wheat-germ oils have been studied, and the values found are considered in agreement with those obtained by isolation procedures. Best results were obtained on 1 percent oil solutions. The accuracy of the method was found to decrease as the concentration of α -tocopherol in the mixture decreased.

Determination of fatty acid monoesters of l-ascorbic and d-isoascorbic acids in fats and oils, J. TURER and R. M. SPECK. (U. S. D. A.). (*Indus. and Engin. Chem., Analyt. Ed.*, 16 (1944), No. 7, pp. 464–465).—It is shown that the 2,6-dichlorophenolindophenol reagent in acetone can be successfully used for the determination of the fatty acid monoesters of l-ascorbic and d-isoascorbic acids in fat and oil substrates. The data given indicate that the proposed method can be used for the determination of the ascorbyl palmitates in concentrations between 0.1 and 10 mg. per gram of sample (0.01 to 1.0 percent). The presence of tocopherol or phospholipids did not interfere with the determination. Tests on ascorbyl monoesterates were made, and comparable results were obtained.

Determination of fluorine in minerals and bones, P. R. GODFREY and C. L. SHREWSBURY. (Ind. Expt. Sta.). (*Jour. Assoc. Off. Agr. Chem.*, 28 (1945), No. 2, pp. 335–338, *illus.* 1).—The authors combined features of the method of Willard and Winter (E. S. R., 69, p. 489) with parts of two other methods, making a number of modifications of their own. The essential steps of the resulting procedure include ashing with magnesium acetate, distillation from perchloric acid, and titration with thorium nitrate and sodium fluoride. A procedure is described for the determination of fluorine, which is a combination of three published methods. Improved apparatus facilitates the distillation and titration of fluorine. Results showed an average deviation between samples of 3.6 percent. Recoveries of 95–99 percent of fluorine from solutions of known content were obtained.

A rapid method for the determination of iron in enriched bread, W. R. RUEGAMER and C. A. ELVEHJEM. (Univ. Wis.). (*Science*, 101 (1945), No. 2617,

p. 206).—A modification of the method of Kitzes et al. (E. S. R., 93, p. 245) has been devised which permits assay of enriched bread without preliminary ashing. In brief, an aliquot of the bread is heated twice with solutions of thioglycolic acid, hydrochloric acid, and trichloroacetic acid. The supernatant liquids are decanted and treated with ammonia until the appearance of a yellow color with *p*-nitrophenol as the indicator, then acidified, buffered, and diluted to volume.

An aliquot is treated with thioglycolic acid to reduce any ferric iron present and the galvanometric reading taken. The α - α' bipyridine reagent is then added and the new reading made.

Iron, when added to enriched bread, has given recovery values ranging from 94 to 105 percent. In the bread samples tested, less than 5 percent of the total iron accounted for could be found in the ashed residues.

The use of *Neurospora* for the determination of choline and biotin in milk products, A. Z. HODSON (*Jour. Biol. Chem.*, 157 (1945), No. 1, pp. 383-385, illus. 1).—A modification in the *Neurospora* method of Horowitz and Beadle (E. S. R., 92, p. 8) has been described for use in choline assays on milk products. The permutit step can be omitted provided the data are selected from the lower steep portion of the assay curves. Biotin assays were also carried out with the same organism and the same milk extracts.

Development of a phosphatase test applicable to Cheddar cheese, G. P. SANDERS and O. S. SAGER. (U. S. D. A.). (*Jour. Assoc. Off. Agr. Chem.*, 28 (1945), No. 3, pp. 656-675, illus. 3).—The authors report upon a detailed investigation of the optimal pH range for the test, the suitability of different buffers and precipitants, the effects of various quantities of cheese samples, the sensitivity of the test, and the advantages of using butyl alcohol for extracting the blue color and evaluating the results.

The optimal pH was found to be approximately 9.6, and a pH not lower than approximately 9.4 or not higher than approximately 9.8 was almost equally satisfactory. The use of a barium borate-hydroxide buffer for establishing the pH uniformly within the proper range and for precipitating proteins and certain other interfering substances is proposed. Application of this test to more than 350 samples of Cheddar cheese, of which records of the milk treatment were available, showed that a very slight lowering below the proper pasteurizing temperature and contamination with as little as 0.1 percent of raw milk in pasteurized milk could be detected in the cheese test. The activity of the phosphatase enzyme in raw-milk cheese was detected very readily in all instances, regardless of the age of the cheese. No instances of phosphatase activity produced in the cheese by starter organisms or by other organisms that occur commonly in the interior of Cheddar cheese were observed.

Comparison of several methods for determining the sulfur content of feeds, R. J. EVANS and J. L. ST. JOHN. (Wash. Expt. Sta.). (*Jour. Assoc. Off. Agr. Chem.*, 28 (1945), No. 2, pp. 360-363).—In a comparison of the official A. O. A. C. magnesium nitrate and sodium peroxide methods, the alkaline permanganate method, the Benedict-Denis method, and two nitric-perchloric acid digestion methods with the Parr bomb method for determining the total sulfur content of feeds, only one of the nitric-perchloric acid digestion methods and the sodium peroxide method gave as high values as did the Parr bomb method. The magnesium nitrate method gave low and variable methods for the sulfur content of the feed samples studied.

The estimation of tryptophane in human urine, A. A. ALBANESE and J. E. FRANKSTON (*Jour. Biol. Chem.*, 157 (1945), No. 1, pp. 59-68, illus. 2).—Samples of urine are passed through permutit to remove some of the nitrogenous bases present which form a mercury complex. The filtrate produced is then acidified and treated with ether to extract any nontryptophan indoles which might be present. The

aqueous fraction is treated with acid mercuric sulfate reagent in order to precipitate and concentrate the tryptophan fraction, and the precipitate thus formed is dissolved in a minimum amount of acid reagent. The authors' previously described method (E. S. R., 88, p. 730) is used for the remainder of the procedure.

"Application of the procedure to 24-hr. specimens of seven normal male subjects on normal diets has revealed that 281 ± 30 mg. of tryptophan are excreted daily, and that the output approximates the value 3.3 mg. of tryptophan per kilo of body weight per day. The origin and physiological implications of urinary tryptophan are discussed."

Analysis of bodied drying and semidrying oils, J. C. COWAN, L. B. FALKENBURG, and H. M. TEETER. (U. S. D. A.). (*Indus. and Engin. Chem., Analyt. Ed.*, 16 (1944), No. 2, pp. 90-92, illus. 4).—Operating details for a determination of the proportions and nature of those polymers in a heat-bodied vegetable oil resulting from self-addition of the fatty acid portions of the oil are described. The method was applied to the analysis of methyl esters bodied in the laboratory and that of commercial oils.

Analysis data for the ternary system acetone-benzene-water, E. HONOLD and H. WAKEHAM. (U. S. D. A.). (*Indus. and Engin. Chem., Analyt. Ed.*, 16 (1944), No. 8, pp. 499-501, illus. 2).—Using the densities and refractive indices of mixtures of the compounds named, as measured at 25° C., the authors were able to develop an accurate and rapid method for determining each component. The procedure described proved practical and satisfactory in connection with pilot-plant solvent recovery problems arising from experiments on the extraction of rubber from goldenrod leaves.

Staining rubber in ground or milled plant tissues, F. W. HAASIS. (U. S. D. A.). (*Indus. and Engin. Chem., Analyt. Ed.*, 16 (1944), No. 7, pp. 480-481).—Following suitable pretreatment of samples, differential staining with Sudan IV and iodine green proved a useful and relatively rapid aid in the microscopic study of rubber in ground guayule tissues, mounts in many cases being ready for examination within 90 min. after starting the schedule.

According to the method here given, the material is to be treated for 15 min. with a 10 percent solution of potassium hydroxide in alcohol. A specified commercial hyochlorite solution is then to be added, and this bleaching reagent allowed to act for 10 min., after which the material is rinsed with water for half an hour. The stain is applied as a weak solution of the two dyes in equal volumes of acetone and 70 percent alcohol for half an hour, the material is rinsed in water, and a mount is made in a glucose sirup.

Detection of destructively distilled wood turpentine: In other kinds of turpentine by means of the aniline point, S. R. SNIDER and H. N. BURSTEIN. (U. S. D. A.). (*Indus. and Engin. Chem., Analyt. Ed.*, 16 (1944), No. 10, pp. 603-605, illus. 1).—It was found that the presence of destructively distilled wood turpentine in gum spirits, and perhaps also in steam-distilled wood turpentine, may be detected by aniline point tests on the high-boiling fraction distilling above 170° C., obtained as described in this paper.

Kinetics of wood saccharification: Hydrolysis of cellulose and decomposition of sugars in dilute acid at high temperature, J. F. SAEMAN. (U. S. D. A.). (*Indus. and Engin. Chem.*, 37 (1945), No. 1, pp. 43-52, illus. 16).—The author describes a method for hydrolyzing small samples of cellulosic materials in glass bombs by heating with direct steam in a rotating autoclave. Much of the convenience and success of the method depended on the fact that the small quantities used made sampling of the products unnecessary; all the hydrolyzate and all the residue were used for the analysis. The work described in this paper was confined to the use of finely divided wood with high liquid-solid ratios. The general principles derived, however, appeared to be confirmed by large-scale operation.

The decomposition of all sugars tested followed the laws of a first-order reaction. The energy of activation of the decomposition of glucose appeared to be independent of the acid concentration over the range 0.4 to 1.6 percent sulfuric acid, and averaged 32,800 calories. As an approximation, the rate of reaction increased 125 percent with a 10° [C.] rise in temperature over the range 170° to 190°. A 100 percent increase in acid concentration resulted in a 102 percent increase in speed.

Of the cellulosic materials of which the hydrolysis was studied, all contained an easily hydrolyzed portion, not further investigated, and a more resistant portion, the hydrolysis of which was a first-order reaction. The hydrolysis of Douglas fir was investigated under conditions ranging from 170° to 190° and 0.4 to 1.6 percent sulfuric acid. A 100 percent increase in acid concentration resulted in a 153 percent increase in hydrolysis rate. The energy of activation of the reaction was independent of the acid concentration and averaged 42,900 calories. As an approximation it may be considered that a 10° rise in temperature resulted in a 186 percent increase in reaction rate.

Theoretical considerations, involving the application of the theory of consecutive reactions to the data indicated above, are discussed.

The rotary digester in wood saccharification, R. H. PLOW, J. F. SAEMAN, H. D. TURNER, and E. C. SHERRARD. (U. S. D. A.). (*Indus. and Engin. Chem.*, 37 (1945), No. 1, pp. 36-43, illus. 9).—A pilot-plant investigation of the dilute acid hydrolysis of wood to sugar was carried out with the use of a 30-in. spherical rotary digester. A schedule for the multistage hydrolysis of wood was established by small-scale laboratory studies and by interrupted cooks. Yields, 50 to 60 gal. of alcohol per ton of wood, approximated those obtained in the stationary percolator. The retention of sugar by the residue remaining in the digester was the principal factor limiting yields obtained by this process. The rate of conversion of cellulose to sugar did not alter with increasing time of exposure to hydrolytic conditions. Limited multistage processes gave yields, including the sugar in the residue, of approximately 75 percent of those obtained in completed multistage operations but required only 25 percent as much time. Single-stage hydrolyses resulted in yields of about 30 gal. per ton in one-tenth the time required for multistage operation. Because of changes in fermentability, maximum yield of alcohol did not coincide with maximum yield of reducing sugar. In both single-stage and limited multistage operations it was necessary to extract sugar remaining in the residue after the last worthwhile withdrawal. Results indicated that increased yields and improved conversion efficiency can be obtained in less time by higher temperatures and acid concentration.

Studies on rum, R. ARROYO (*Puerto Rico Univ. Sta. Res. Bul.* 5 (1945), pp. 272+, illus. 38; *Span. abs.* pp. 261-270).—When work on this project was begun, methods were found to be those of a very old industry, being especially primitive and empirical in the fermentation process. "The nature and necessary characteristics of the fermentation agents employed were utterly unknown or disregarded, and absurd . . . curing practices" were applied to the raw rums. The results of 6 yr. of work (1936-42) designed to provide a sound technological basis for rum manufacture are here presented. Following a brief introduction, the principal contents are: The raw material; yeast selection; mashing operations; mitogenetic radiation; rum fermentation; rum distillation; rum curing and maturing; rum aroma; rum composition and appraisal; and biological and chemical control of the rum distillery.

AGRICULTURAL METEOROLOGY

Upper-air trajectories and weather forecasting, D. FULTZ (*Univ. Chicago, Dept. Met., Misc. Rpts. No. 19* (1945), pp. 123+, illus. 46).—This report is an

attempt to improve forecasting of the surface and upper pressure distributions by means of a trajectory technic applied primarily to the 10,000-ft. chart in coordination with such other aids as are ordinary or were found useful. Consideration is given to some of the theoretical principles involved, the procedure as developed to date, some empirical ideas which appeared to be of value, and an account of the verification obtained. The information presented should serve to show under what conditions profitable use can be made of the full procedure, where it would be impractical, and what additional indications may be derived from a careful inspection of the ordinary charts in view of the ideas here expressed.

Comparison of lower-cloud bases with condensation levels, R. C. BUNDGAARD (*Amer. Met. Soc. Bul.*, 27 (1946), No. 1, pp. 1-5, illus. 2).

Is there a ring of violent upward convection in hurricanes and typhoons? C. E. DEPPERMAN (*Amer. Met. Soc. Bul.*, 27 (1946), No. 1, pp. 6-8, illus. 1).

An analysis of an unusual rainfall distribution in a hurricane, E. M. BROOKS (*Amer. Met. Soc. Bul.*, 27 (1946), No. 1, pp. 9-14, illus. 4).—The author presents an attempt to account for the unusual distribution of rainfall observed in the tropical hurricane of October 6-8, 1941, in the southeastern United States.

Foreshadowing the winter precipitation in Montana and Florida, I. I. SCHELL (*Amer. Met. Soc. Bul.*, 27 (1946), No. 1, pp. 33-34).—Presentation of hitherto unpublished foreshadowing of precipitation in these two States for the winter of 1942-43, prepared at the time. Tropical Australasia pressure of the preceding September-November formed the basis for computing the deviations in winter precipitation.

Climatic factors affecting crop production, E. C. STACEY (*Sci. Agr.*, 26 (1946), No. 2, pp. 79-82).—The Dominion Experimental Station at Beaverlodge, Alberta, "has on record perhaps the largest body of meteorological data of any of the northern stations and is situated on what might be regarded as the southern fringe of northern agriculture." For this reason its records are used to a considerable extent in the survey here presented, which includes information on precipitation, evaporation, air and soil temperatures, sunshine, and wind. The crops of the northern area—including wheat, alfalfa, cereals, grasses, and clovers—and the climate in general are discussed briefly.

Weather and climate of the Northwest Territories, J. L. ROBINSON (*Canad. Geog. Jour.*, 32 (1946), No. 3, pp. 124-139, illus. 35).—"Many misconceptions and misstatements as to actual conditions and future possibilities of the Northwest Territories have been based upon an inadequate knowledge of climatic conditions." One of the causes is undoubtedly that these areas comprise one-third of Canada and that the climate thus differs markedly from one region to another. The basic difference lies in the type and length of summer: The eastern areas are Arctic, but have a short cool summer; the Northwest—despite its northern latitude—has summer periods often as warm as in more southerly parts of the country. The information here presented is based on the findings of the governmental meteorological stations established throughout the Northland. It is concluded that if resources are found which are rich enough to compete with those closer to present markets, climate will not be a principal obstacle impeding development of the Canadian Northwest.

Anuario meteorológico, 1937-1943 [Meteorological Yearbook, 1937-43], L. H. OSORIO (*Bogotá, Colombia: Min. Econ. Nac.*, 1944, pp. 332).—A compilation of meteorological data for Colombia, 1937-43.

Problems of Scottish climatology, G. MANLEY (*Scot. Geog. Mag.*, 61 (1945), No. 3, pp. 73-76).—An address.

Climate and China's agricultural industry, E.-L. LIU (*Jour. Geog.*, 45 (1946), No. 3, pp. 90-96).—A general discussion of the influence of climate on China's agriculture—past and present.

Solar heat in relation to bacterial soft rot of early Irish potatoes, L. W. NIELSEN. (N. C. Expt. Sta.). (*Amer. Potato Jour.*, 23 (1946), No. 2, pp. 41-57, illus. 3).—Tubers exposed to direct sunlight during June and July for as little as 60 min. developed more bacterial soft rot than those picked up and packed as soon as dug. Prolonged exposure may cause two changes: (1) The tuber tissues may be killed, or (2) if the absorbed heat causes the temperature to rise to 113° F. or above (sublethal) there will be no symptoms of injury, though the tubers become more susceptible to the soft rot when inoculated through bruises made during harvesting. The latter change is apparently a reversible process from which tubers recover if not spontaneously or artificially inoculated. The results of the laboratory studies on temperatures and intervals of exposure were first interpreted as the thermal death point. As the work progressed, it became evident that this was incorrect. The thermal death point of tuber tissues at 1 hr. of exposure is believed to be above 122°. The temperatures determined in the laboratory tests were more likely those at which changes in tuber susceptibility take place.

Bacterial soft rot of Irish potatoes as influenced by sublethal temperatures—sugar and permeability changes in the tubers, L. W. NIELSEN and F. A. TODD. (N. C. Expt. Sta.). (*Amer. Potato Jour.*, 23 (1946), No. 3, pp. 73-87, illus. 2).—Recent studies indicated that tubers exposed to solar or artificial heat become more susceptible to bacterial soft rot (see preceding entry). In the present study, the reducing and total sugar concentrations in the juice of the tubers was found to be greatest in those stored at 4° and 40° C.; the amount of sugar was not correlated with the heat-induced susceptibility. An inverse relationship existed between the H-ion concentration and that of total sugars in the juice at 4° to 40°. Cell membrane permeability increased at high storage temperatures and following sublethal heat treatments; this increase is believed to play a role in bacterial infection of the tubers by permitting the diffusion of sugars (and probably other nutrients) into the cell walls and intercellular spaces, where they become more accessible to soft rot bacteria on artificial or spontaneous inoculation through wounds. There are 14 references.

SOILS—FERTILIZERS

Soils and soil management, A. F. GUSTAFSON (*New York and London: McGraw-Hill Book Co.*, 1941, pp. 424+, illus. 165).—The purpose of this book is the presentation of information dealing with the management of soils in the field. Emphasis is placed on ways and means of handling soils for economic production of crops. The book was written for the student of practical soil management on the farm and in the classroom, but has much of interest also to owners and operators of farm land. The contents are: The origin and placement of soil materials and soil formation; the physical properties of soils; soil organisms; the organic matter of mineral soils; the relation of water to soils and plants; the control of water in the soil; tillage; erosion and its control; soil acidity and its control by liming; the management of alkali soils; nitrogen and its importance to the farmer; the production, conservation, and utilization of farm manures; the production and utilization of green-manure crops; fertilizer materials and their effects on soils and crops; commercial fertilizers and their use; the rotation of crops; the fertilization and the long-term maintenance of the productivity of mineral soils; and the origin of organic deposits and peat soils and their management. Appendix A lists the common and botanical names of a number of common plants, and Appendix B gives some approximate equivalents and formulae.

Collecting soil samples for chemical analysis, L. C. OLSON and R. P. BLEDSOE (*Georgia Sta. Cir.* 148 (1945), pp. 7, illus. 3).—This circular presents in detail information on time of sampling; how to obtain representative samples, with a

schematic illustration for taking samples that can be worked out for fields of various sizes and shapes; depth of sampling; technic of sampling; and shipping of sample.

Soil sampling tube, J. B. HESTER and K. HANKINSON (*Jour. Amer. Soc. Agron.*, 37 (1945), No. 12, pp. 1041-1042, illus. 1).—The authors briefly describe and illustrate in a dimensioned drawing a sampling tube of which the principal feature consists in the insertion of a choke ring, sharpened to constitute the cutting edge of the instrument, such that the core of soil is cut slightly smaller than the bore of the main part of the tube. The upper end of the tube is of unobstructed internal diameter, and the core is slid out by inverting the tube. The sampler is described as being constructed from stainless steel or hard brass. It is shown in the drawing as 3 ft. in over-all length, the tubing being of 1 in. internal diameter with wall $\frac{1}{8}$ in. thick. The inserted choke and cutting edge is indicated to be of 1 in. outside diameter, $\frac{1}{8}$ in. wall thickness, and $\frac{3}{8}$ in. deep. The cutting edge is sharpened to an angle of about 10° .

This tube was found "not entirely satisfactory for stony or extremely dry soils," but satisfactory for moist clay or for sandy soils, simple of construction, and easy to twist into the soil by hand.

Soil survey of Lincoln County, Tennessee, F. RUDOLPH ET AL. (Coop. Tenn. Expt. Sta. et al.). (*U. S. Dept. Agr., Bur. Plant Indus., Soils, and Agr. Engin. [Soil Survey Rpt.]*, Ser. 1937, No. 16, pp. 135+, about 8 illus.).

The occurrence of Clostridium botulinum and Clostridium tetani in certain plots of soil, E. W. COOK, JR. (*Ohio State Univ., Abs. Doctoral Diss.*, No. 47 (1945), pp. 9-14).—The occurrence of *C. botulinum* and *C. tetani* was investigated in 131 samples of soils obtained from field plots receiving different treatments. The study revealed that the population of *C. botulinum* in the soil of the plots used remained approximately the same over a long period of time and with a variety of treatments. On the other hand, the population of *C. tetani* in the soil of these plots varied. The best treatment for the occurrence of *C. botulinum* in the plots was manure only, but any combination of manure and chemicals, such as phosphate and lime, used as fertilizer was also good. *C. tetani* was more often found in the soil of plots which had been treated with a combination of manure and chemicals, such as lime and phosphate, though the chemicals alone were also good.

Both *C. botulinum* and *C. tetani* were more often found in those plots that were sown to wheat than in any other crop studied. Most of the plots yielded strains of *C. botulinum* and *C. tetani* which were highly toxic. The toxicity of samples from which these strains came followed those treatments of the plots which best maintained *C. botulinum* and *C. tetani* in them.

Lipid production by a soil yeast, R. L. STARKEY. (N. J. Expt. Stas.). (*Jour. Bact.*, 51 (1946), No. 1, pp. 33-50, illus. 14).—The yeast was recovered from several soils and thus is thought to be a common soil inhabitant. The yeast cultures considered in this article were obtained from colonies which developed on a nitrogen-free agar medium. The yeast is of interest because of its high lipid content and because of unusual spore formation. The sequence of changes observed in cultures is illustrated. The metabolism of the yeast was investigated.

The characteristics of the yeast are different from those of previously described yeasts which have been studied for lipid synthesis. It was not possible to identify the yeast with known species. The yeast may be a new species or a yeast already described but with certain characteristics which have not been recognized up to this time. Growth and lipid production were good in aerated glucose solutions containing small amounts of yeast extract as the nitrogen source. Under favorable conditions, 20 to 25 percent of the consumed glucose was converted to yeast cells which contained 50 to 63 percent lipid. From 10 to 14 percent of the consumed glucose was recovered as lipid. The lipid content of the cells decreased as the

nitrogen content of the medium increased. Only a small portion of the lipide could be extracted from the cells directly with fat solvents, but it became released by hydrolysis with dilute acid.

The land renewed: The story of soil conservation, W. R. VAN DERSAL and E. H. GRAHAM (*New York: Oxford Univ. Press, 1946, pp. 109+, about 50 illus.*).—This well illustrated book presents in popular form the history of the development of practices of land use in America and the importance of preservation of topsoil to the security of the country. Different types of erosion and the extent of different kinds of damage are considered. Present remedies for control of erosion and renewal of soil productivity are outlined.

Report of the Chief of the Soil Conservation Service, 1945, H. H. BENNETT (*U. S. Dept. Agr., Soil Conserv. Serv. Rpt., 1945, pp. 55*).—A summary of the year's activity in applying soil conservation practices to the land, with a consideration of the benefits of conservation farming and the conservation job ahead. Brief statements are presented on various phases of the soil and water conservation research program, including brief notes on research findings.

Bamboo for controlling soil erosion, D. G. WHITE and N. F. CHILDERS. (*U. R. Fed. Expt. Sta.*). (*Jour. Amer. Soc. Agron., 37 (1945), No. 10, pp. 839-847, illus. 7*).—Among various advantages of several of the *Bambusa* species as erosion control plants the matted, extensive, and comparatively shallow root systems are emphasized. A hillside clump of *B. tulda*, for example, was found to have roots extending 17 ft. from the culm, with 83 percent of the root system in the top foot of soil and only 1 percent between 3 and 4 ft., below the surface. A 4-year-old planting of *B. longispiculata* on a 52-percent slope was found to have deposited a leaf mulch from 2 to 4 in. in thickness during a dry period of from 3 to 4 mo., and erosion, which had begun gully formation on this slope before the bamboo planting, not only showed no further advance but the ditches already formed were covered with leaves and the soil well penetrated by roots. Bamboo species are recommended for the reinforcement of embankments of mountain roads and for stream bank protection. In use for the last-named purpose, a bamboo revetment, with growing bamboo in the stream bank behind this retaining wall, is illustrated. Culms may be cut for commercial uses without loss of the soil holding value of the plantings.

Relation of vegetative cover to the plant growth conditions of eroded soils, R. M. WARNER. (*Iowa Expt. Sta. coop. U. S. D. A.*). (*Iowa State Col. Jour. Sci., 20 (1945), No. 1, pp. 101-153, illus. 17*).—This paper covers qualitative and quantitative tests of soil conditions where plant communities were found, the changes brought about by natural and introduced vegetation, and the changes in vegetation and soil structure resulting from water conservation practices in the eroded soils of southeastern Iowa. Plant cover changes to the conditions of the habitat were studied on a site where change was accelerated by basin-listing. The second situation studied was a series of plant communities representing stages in secondary plant succession. A marked increase in soil moisture was evident from the fact that the available moisture, although fluctuating greatly in the surface 6 in., was below the wilting point only twice in the basin-listed area. In an adjacent comparable area, not so treated, the soil was below the wilting percent during most of the growing season. This area supported only plants of the weed and perennial forb stages. Depth of percolation of water was approximately three times as great in the basin-listed area as in a comparable eroded Lindley loam area without basin-listing treatment. Noncapillary porosity was generally higher and volume-weight lower in the soil under the advanced plant cover types than under the weedy types. A high correlation was found between volume-weight determinations and total porosity of the same samples. A lower correlation was

found between volume-weight and noncapillary porosity. The former was considered to be a good measurement of soil structure as related to plant development because of its relationship to percolation rate and soil aeration. Runoff percentages tended to be lower and depth of penetration higher as the stages of the succession approached the climax.

The effect of plowing under and the time of plowing under legumes on the conservation of nitrogen, J. W. TIDMORE and N. J. VOLK. (Ala. Expt. Sta.). (*Jour. Amer. Soc. Agron.*, 37 (1945), No. 12, pp. 1005-1010).—With the purpose of observing the effect of the time of plowing under legumes on the conservation of the nitrogen in the legumes, the effect on succeeding crops, and the effect on the chemical composition of the soil, six cropping systems were used in four series of 1/600-acre concrete bins.

Plowing under soybeans in the spring was superior to plowing them under in the fall because in the latter case nitrogen in the soybeans was lost by leaching during the winter as a result of nitrification during the warm fall months. Allowing soybeans to remain on top of the ground all winter gave quite satisfactory results with respect to conservation of nitrogen, as did cutting them and storing them in the barn until spring. The loss of nitrogen by leaching following the plowing under of soybeans in the fall is believed to have been undoubtedly in excess of 25 lb. per acre. Plowing under soybeans for 9 yr. had practically no effect on the exchange capacity, exchangeable hydrogen, calcium, and magnesium, or the pH of the soil. Total organic matter was increased about 60 percent over the 9-yr. period by plowing under legumes every other year. At the end of the 9-yr. period, soils on which legumes were plowed under contained about 30 percent more nitrogen than did soils that received no legumes.

Effect of crop residues on soil temperature, T. M. MCCALLA and F. L. DULEY. (Nebr. Expt. Sta. coop U. S. D. A.). (*Jour. Amer. Soc. Agron.*, 38 (1946), No. 1, pp. 75-89, illus. 3).—Soil temperatures were determined under the quantities of residues used in the system of subsurface tillage, or stubble mulching, as compared with soil temperatures when using heavy mulches or the conventional system of plowing. Heavy mulches, such as an 8-ton per acre application of straw, lowered soil temperatures as much as 17.7° C. at the 1-in. depth. For a period of 3 or 4 mo. after the application of a straw mulch at the rate of 2 or 3 tons per acre, soil temperatures may be reduced from 3° to 6° at the 1-in. depth and 2° to 4° at the 4-in. depth. In the stubble mulch system of farming, soil temperatures were not reduced appreciably below that of plowed land after 6 to 9 mo. In such farming, only quantities of residues equal to those grown on the land were returned to the surface of the soil, while decay and fragmentation of the residue continued. Soil temperature of the mulched plots lagged behind air temperature. This difference reached a peak on clear days at about 1 to 2 o'clock. Soil temperature reached the lowest point for the day along with the air temperature at about 5 a. m. At 15 time mulched and bare plots usually had almost the same temperature. After considerable decay had taken place, the temperature at the time of widest differences was only a few degrees lower on the mulched soil. Generally, soil temperature under mulches did not appear to be unfavorable to plant growth where a quantity of residues equal to that grown on the field was used. Mainly because of shading, a growing crop on the land decreased the temperature differences between the mulched and unmulched soil.

Yield-depression effect of fertilizers.—IV, Initial or "near-end depression," O. W. WILLCOX (*Jour. Amer. Soc. Agron.*, 38 (1946), No. 2, pp. 99-107, illus. 4).—The author subjects two field experiments carried out by the Maine Experiment Station (E. S. R., 89, p. 209) to an agrobiological analysis as indicated in the previous papers of this series (E. S. R., 94, p. 23), with the aid of the standard

yield diagram. In the one test where nitrogen was applied together with a base fertilization of phosphorus and potassium, the resulting yield curve followed a normal course, but where only the base fertilization was applied the yield was far below normal expectancy, despite the indicated presence of 1.8 baules (401.4 lb.) of original soil nitrogen. A parallel situation was found in this test where potassium was varied against a base fertilization of nitrogen and phosphorus. From these relations it is deduced that the original and part of the added increments of nitrogen and potassium were inhibited by some unknown soil condition, and that the normal yield curves found for the nitrogen and potassium treatments are the traces of the action of the uninhibited portions of these nutrients. This type of yield depression, or yield depreciation, is called "near-end depression" because it is observed at the beginning of the curve. In the phosphorus series of this test near-end depression appears to be absent; that is, there was no clear evidence of inhibition of the original soil P_2O_5 . On the other hand, the superior increments of phosphorus in this series produced a mild example of the much more common "far-end depression," by which is designated the direct depressive effect observed when a plant nutrient is added to the soil in excess. In the other field test, which was made with graded increments of a 4-8-7 fertilizer, near-end depression was also observed in the control plots.

Sodium as a plant nutrient and substitute for potassium, M. E. HOLT and N. J. VOLK. (Ala. Expt. Sta.). (*Jour. Amer. Soc. Agron.*, 37 (1945), No. 10, pp. 821-827, illus. 1).—Sodium applied to sand cultures in the absence of potassium increased the growth of the seven crops tested by an average of 53 percent, the smallest increase being 17.1 percent for Austrian winter peas and the largest 185.8 percent for cotton. The beneficial effect of sodium on plant growth in the greenhouse, in general, decreased as the potassium level of the nutrient media increased, but not in direct proportion to it. Sodium increased the number of bolls that matured on cotton grown in the greenhouse on both sand and soil cultures when the potassium concentration in the nutrient media was less than about 300 lb. of potassium per acre in the sand cultures and less than 72 lb. of available potassium per acre in the soil cultures. The concentration of sodium in the plant tissue, after a severe initial decrease from the application of a small amount of potassium, became with additional potassium application approximately inversely proportional to the potassium concentration in the plants. Results obtained from 47 field tests with cotton grown on sandy soils of low productivity show that the addition of sodium increased the yields of seed cotton by 98 to 213 lb. per acre. The results indicate that plants vary in their need for and capacity to utilize sodium, that for some plants sodium may be an essential nutrient for maximum growth, and that sodium can be substituted for potassium to a variable extent, depending on the kind of plant. Beneficial results may be expected from the application of sodium to soils low in either available potassium or sodium, or both. The substitution of other forms of nitrogen in place of sodium nitrate as a source of nitrogen for sandy soils may in time necessitate the addition of sodium in some form to obtain maximum yields of some crops.

Gypsum, a soil corrective and soil builder, W. T. McGEORGE (*Arizona Sta. Bul.* 200 (1945), pp. 14+, illus. 3).—This bulletin presents, in popular form, information regarding the agricultural use of gypsum. Specific phases discussed include its solubility, fineness, and quality; reasons for its use; gypsum and black alkali; reclamation of black alkali soils, and preventing black alkali formation; reclamation of white alkali soils; gypsum and soil structure; prevention v. reclamation; and hard v. soft water. The author points out that gypsum and gypsite are excellent correctives, useful in the reclamation of both black alkali and white alkali soils and of value in improving the structure of irrigated soils. Two tons per

acre is recommended for black alkali soils and 500 to 2,000 lb. per acre for white alkali soils, depending upon the physical condition.

Sulphur, a soil corrective and soil builder; W. T. McGEORGE (*Arizona Sta. Bul. 201 (1945), pp. 20+*, illus. 1).—This bulletin presents information on the use of sulfur for direct application to the soil and other uses related to agriculture. Recommendations for its use suggest from 100 to 200 lb. per acre broadcast as a fertilizer; as an acidulating agent 200 to 400 lb. per ton of mixed fertilizer; for chlorosis 25 to 100 lb. per tree; for black alkali soils—100 to 200 lb. per acre as a preventive, 1,000 to 1,500 lb. for reclamation; for white alkali soils 200 to 400 lb. per acre; and for improving and maintaining soil structure 100 to 200 lb. per acre annually.

Minor elements: Evidence and concepts on functions, deficiencies, and excesses, edited by F. E. BEAR and H. B. KITCHEN (*Baltimore: Williams and Wilkins Co., 1945, pp. 189+*, illus. 17).—This symposium contains reprints of papers previously noted. The general articles and specific summary articles by individual elements are as follows: The Geochemical Background of Minor-Element Distribution, by V. M. Goldschmidt (pp. 1-7) (E. S. R., 94, p. 165); The Occurrence of Mineral Nutritional Diseases of Plants and Animals in the United States, by K. C. Beeson (pp. 9-13) (U. S. D. A.) (E. S. R., 94, p. 202); Minor Elements in Plants, and Some Accumulator Plants, by W. O. Robinson and G. Edgington (pp. 15-28) (U. S. D. A.) (E. S. R., 94, p. 177); Minor Elements and Vitamin Content of Plants, by K. C. Hammer (pp. 165-171) (U. S. D. A.) (E. S. R., 94, p. 316); Biological Function of Minor Elements, by O. Baudisch (pp. 173-184); Use of Microorganisms to Determine Essentiality of Minor Elements, by R. A. Steinberg (pp. 185-189) (U. S. D. A.) (E. S. R., 94, p. 316); and—under the general heading, Minor Elements Essential to or Contained in Plants or Affecting Animals Consuming Them—Aluminum in Soils, Plants, and Animals, by G. E. Hutchinson (pp. 29-40), Boron in Plant Life, A Brief Historical Survey, by J. W. Shive (pp. 41-51) (N. J. Expt. Stas.), Influence of Chlorine on Plants, by A. R. C. Haas (pp. 53-61) (Calif. Citrus Sta.), Cobalt and Nickel in Soils and Plants, by R. L. Mitchell (pp. 63-70), Copper and Plant Growth, by A. L. Sommer (pp. 71-79) (Ala. Sta.), and Fluorine in Soils, Plants, and Animals, by H. H. Mitchell and M. Edman (pp. 81-90) (Univ. Ill.) (all E. S. R., 94, p. 178), Iron in Leaves, by J. P. Bennett (pp. 91-105) (Univ. Calif.), Certain Factors Affecting the Availability, Absorption, and Utilization of Magnesium by Plants, by H. P. Cooper (pp. 107-114) (S. C. Sta.), The Role of Manganese in Agriculture, by J. S. McHargue (pp. 115-118) (Ky. Sta.), Molybdenum in Relation to Plant Growth, by D. R. Hoagland (pp. 119-123) (Univ. Calif.), Selenium in Soils, Plants, and Animals, by S. F. Trelease (pp. 125-131), Silicon in Plant Growth, by G. J. Raleigh (pp. 133-135) (Cornell Univ.), Sodium as a Crop Nutrient, by P. M. Harmer and E. J. Benne (pp. 137-148) (Mich. Sta.) (all E. S. R., 94, pp. 316, 317, 319), Sulfur Deficiency in Soils, by W. Crocker (pp. 149-155) (E. S. R., 94, p. 165), and Zinc as a Nutrient in Plant Growth, by A. F. Camp (pp. 157-164) (Univ. Fla.) (E. S. R., 94, p. 319).

Versuche und untersuchungen über die wirkungen des bors als spurenelement [Investigations on the effect of the minor element boron], E. TRUNINGER (*Lundw. Jahrb. Schweiz, 58 (1944), No. 1, pp. 1-36, illus. 9; Fr. abs., pp. 35-36*).—Soil and plant investigations are reported on the need for boron of various plants under different soil conditions and on the interrelationships of boron with other elements.

Preliminary greenhouse studies of digested sludge as a fertilizer, H. A. LUNT. (Conn. [New Haven] Expt. Sta.). (*Sewage Works Jour., 18 (1946), No. 1, pp. 46-53, illus. 2*).—Conditional sewage sludge cake experimental tests designed for observational effect on yields of various crops gave results that do not appear too favorable for sludge as a fertilizer. Immediate increases in crop yields can hardly be expected under all conditions and all crops. Undoubtedly occasional or

frequent use of such material is beneficial to the soil in the long run, and the sandier in the texture and the lower fertility, the more likely this would be true. Inasmuch as sludge is not a balanced plant food, it is imperative that adequate supplies of potash be provided, particularly for those crops with high potash requirements.

From the standpoint of yield of the first crop as well as the matter of possible health hazard, sludge should be applied at least several months prior to planting. Supplementary applications of nitrogen can be made to advantage at planting time.

Organic material and ammonium nitrate in fertilizer mixtures, R. O. E. DAVIS and J. O. HARDESTY. (U. S. D. A.). (*Indus. and Engin. Chem.*, 37 (1945), No. 1, pp. 59-63, illus. 3).—The authors point out that although ammonium nitrate shows a tolerance for small quantities of organic materials, its action upon larger proportions of organic components in mixtures in which the nitrate and organic combustibles are diluted with other fertilizer constituents has not hitherto been ascertained; and fires suspected of originating in such mixtures have occurred.

A base mixture containing 1,400 lb. of superphosphate and 400 lb. of ammonium nitrate with as little as 50 lb. of an organic meal was found capable of originating a fire under unusual conditions. Preliminary experiments showed that spontaneous combustion occurred in this mixture after storage for several weeks at 30° C. From tests with a variety of mixtures the conclusion was drawn that the presence or formation of free acid initiated exothermic reactions which between 90° and 110° resulted in spontaneous combustion. Proper neutralization with ammonia offered safety from fire under severe conditions, even with much larger ratios of organic meal to ammonium nitrate. Cooling or dissipation of heat will avoid reaching the critical temperature.

Greenhouse and laboratory experiments with nitrogen-bearing aluminum dross as a fertilizer, L. F. RADER, JR., D. S. REYNOLDS, and K. D. JACOB. (U. S. D. A.). (*Jour. Amer. Soc. Agron.*, 37 (1945), No. 12, pp. 1024-1032, illus. 2).—Dross from the melting and refining of aluminum and aluminum alloys contains nitrogen in the form of nitrides. The nitrogen content of 21 samples of the material from plants throughout the United States ranged from 0.43 to 10.35 percent and averaged 5.05 percent.

In greenhouse pot experiments with millet and tomatoes on Sassafras fine sandy loam and Sassafras sandy loam, respectively, the dross had only from 1 to 33 percent as much effect in increasing the dry-weight yields as had the same quantity of nitrogen in the form of ammonium sulfate. There were indications that some samples of dross contain substances which may have a small depressive effect on plant growth. The effect of dross on plant growth was directly related, in general, to the rate and extent of conversion of the nitrogen to ammonia in aqueous medium and to its nitrification in the Chester silty clay loam used in these experiments.

AGRICULTURAL BOTANY

The herbal of Rufinus, edited by L. THORNDIKE (*Chicago: Univ. Chicago Press*, 1946, pp. 476+).—A printing of this late thirteenth century manuscript, with an introductory chapter by the editor.

[Abstracts of bacteriological papers] (*Jour. Bact.*, 51 (1946), No. 1, pp. 125, 129).—The following are included: Bacterial Penicillinase—Production, Nature, and Significance, by A. Bondi, Jr., and C. Dietz; and The Antagonistic Action of the By-Products of a Culture of *Aspergillus wentii* on the Legume Bacteria, by R. S. Robison, and Spontaneous Development of Bubbles of Gas in Agar Medium, by J. K. Wilson (both Cornell Univ.).

Marine microbiology: A monograph on hydrobacteriology, C. E. ZOBELL (*Waltham, Mass.: Chron. Bot. Co.*, 1946, pp. 240+, illus. 13).

On the existence, morphology, nature, and functions of the cytoplasmic membrane in the bacterial cell, G. KNAYS. (Cornell Univ.). (*Jour. Bact.*, 51 (1946), No. 1, pp. 113-121, illus. 14).—The study of spontaneously autolyzed cells in cultures of *Bacillus cereus* and *B. megatherium* rendered possible the isolation and demonstration of the cytoplasmic membrane. The fact that this membrane is much more resistant to autolysis than the cytoplasm proper indicates considerable chemical or physicochemical differences between them. The cytoplasmic membrane stains with dyes of the Sudan series and gives the Sharp test for proteins and a positive Feulgen reaction; it consists principally of lipoids and proteins in a highly stable chemical combination. The significance of the positive Feulgen reaction is discussed. The internal surface of the cytoplasmic membrane is jagged and wavy; besides surrounding the cytoplasm, it forms plane films which separate the cells into compartments and which are potential places of cell division; it forms and eliminates into the cytoplasm granules similar to itself in chemical composition; its demonstrated roles are in cell division and in permeability. The thickness of the cytoplasmic membrane was found to vary even in a single cell; in young cells of *B. cereus* it was usually 0.21μ to 0.35μ in thickness.

Studies on cellulose fermentation.—II, An anaerobic cellulose-decomposing actinomycete, *Micromonospora propionici* n. sp., R. E. HUNGATE. (Wash. State Col.). (*Jour. Bact.*, 51 (1946), No. 1, pp. 51-56, illus. 2).—During studies of cellulose decomposition (E. S. R., 92, p. 479).—in this case by termites—anaerobic shake tubes of agar medium containing cellulose were inoculated with serial dilutions of the crushed alimentary tract of a worker termite; several large clear spots developing in the cellulose suggested the presence of an actinomycete and isolation indicated it to be this new species of *Micromonospora*. The further demonstration that it carried on a propionic acid fermentation provides physiological evidence supporting the hypothesis of an origin of the actinomycetes from the propionic acid bacteria.

Morphological characteristics of a purified thermophilic cellulose decomposing culture, D. B. PRATT. (Purdue Univ.). (*Ind. Acad. Sci. Proc.*, 54 (1944), pp. 75-78, illus. 1).—In culture tubes of ground up filter paper in peptone mineral salt solution two zones of development appeared to function—one near the surface and the other near the cellulose fibers at the bottom. At the top large uniform rods developed; in the bottom, a more filamentous form. "Amorphous cocci" were observed first at the bottom and later throughout the medium. Filaments bearing a large terminal spore—atypical in staining reactions—were noted after 48 hr.; thus the large oval body cannot properly be termed a spore. Observations of the development of the culture indicated that the evolution of gas is responsible for the mixture of types usually observed.

On the utilization and synthesis of sucrose and related compounds by some microorganisms, M. DOUNOROFF. (Univ. Calif.). (*Fed. Proc. [Fed. Amer. Soc. Expt. Biol.]*, 4 (1945), No. 3, pp. 241-247).—A review (37 references) of the possible mechanisms of sucrose synthesis in certain bacteria and the suggestion that they might also apply to the problem of the production of polysaccharides and disaccharides other than sucrose in both plants and animals. It is concluded that the key to the formation of many disaccharides and polysaccharides appears near discovery, but up to the present it has in most cases eluded a direct approach. The roles of the exchange of phosphoric ester bonds for glycosidic linkages and of the exchange of glycosidic bonds themselves have given a clue to the types of reactions to be sought in carbohydrate syntheses. The mechanism of sucrose synthesis in plants seems to be one of the most promising reactions for study, and its understanding would contribute greatly to the elucidation of a number of related processes.

The inactivation of iron by 2,2'-bipyridine and its effect on riboflavin synthesis by *Clostridium acetobutylicum*, R. J. HICKEY (*Arch. Biochem.*, 8 (1945), No. 3, pp. 439-447, illus. 1).—2,2'-Bipyridine proved capable of inactivating Fe in the

fermentation of corn mash by *C. acetobutylicum* so that a marked increase in riboflavin production was promoted. Although it inactivated Fe in molasses fermentation by industrial molasses-fermenting strains of *C. acetobutylicum*, an increase in riboflavin production was not observed.

The utilization of staled media by fungi, C. L. PORTER. (Purdue Univ.). (*Ind. Acad. Sci. Proc.*, 54 (1944), pp. 81-83).—In the experiments reported, *Penicillium notatum* appeared unaffected by staling products in the medium; *Staphylococcus aureus* proved quite sensitive to them. A staled medium becomes progressively more acid; this affects the growth of most bacteria. *Bacillus brevis*—serving as the staling agent—influenced the growth of the two test organisms in the same way that growth had been affected by chance contaminating organisms. It is concluded that a medium remaining unsterilized is not one that will support the normal development of bacteria, nor probably of most fungi.

The inhibition of sulphate-reducing bacteria by dyestuffs.—II, Practical applications in cable storage tanks and gas holders, T. H. ROGERS (*Jour. Soc. Chem. Indus., Trans. and Commun.*, 64 (1945), No. 10, pp. 292-295).—A previous study² indicated that the sulfate-reducing bacteria could be inhibited by flavine-type dyestuffs. This paper describes their practical application in preventing corrosion of submarine cables, the fouling of gas holder waters, and the fouling of heat washing plants by such bacteria producing H_2S . An appendix, Treatment of Sulphate-Reducing Bacteria in a Flour Mill (p. 295), is by E. C. Barton-Wright.

Variation in *Penicillium notatum* induced by the bombardment of spores with neutrons, H. J. HANSON, W. G. MYERS, G. L. STAHLY, and J. M. BIRKELAND. (Ohio State Univ.). (*Jour. Bact.*, 51 (1946), No. 1, pp. 9-18, illus. 2).—Marked variation appeared in cultures from spore suspensions exposed to bombardment with slow neutrons for 1 hr. to 134 days, the number of variants increasing with duration of exposure. Actively growing cultures treated for 3 hr. showed no definite evidence of induced variation. Variation similar to that induced with slow neutrons occurred when moist and dry spores were bombarded with fast neutrons for 15 and 30 min.; 180 min. killed all spores. Isolations and studies were made of 150 variants characterized by differences in such aspects as color, texture, rate and quantity of vegetative growth and of sporulation, color and amount of transpired fluid, and color of the reverse of the colonies. A screening test, surface cultivation, and preliminary tests in submerged cultivation showed the variants to differ greatly in their capacity to produce penicillin, some no longer possessing this property and others giving yields considerably higher than those from the parent culture. Comparative studies on the morphology and on penicillin production in surface culture revealed the parent strain and a buff-colored variant to be nearly identical except for color. No qualitative differences were observed when the inhibitory substance produced by 62 variants was tested against 10 species of bacteria.

Penicillin.—VII, Penicillinase, R. G. BENEDICT, W. H. SCHMIDT, and R. D. COGHILL. (U. S. D. A.). (*Arch. Biochem.*, 8 (1945), No. 3, pp. 377-384).—In this phase of the investigation (E. S. R., 93, p. 410; 94, p. 168), papain, lysozyme, urease, peptidases from porcine duodenal mucosa, povidase, emulsin, ficin, trypsin, pure carbonic anhydrase, crude α - and β -amylase, and one lot of takadiastase proved inactive against penicillin; concentrated pumpkin protease and high diastatic malt sirup showed some destructive activity. A method is described for producing a very potent exocellular penicillinase by using *Bacillus cereus* (NRRL B-569); 1 mg. destroyed 165,000 units of crystalline penicillin in 3 hr. at pH 7.0 and 30° C.

Penicillin, VIII, IX, A. J. MOYER and R. D. COGHILL. (U. S. D. A.). (*Jour. Bact.*, 51 (1946), No. 1, pp. 57-93, illus. 2).—The following in this series (E. S. R., 94, p. 168) are included:

² *Jour. Soc. Chem. Indus., Trans. and Commun.*, 59 (1940), No. 2, pp. 34-39.

VIII. *Production of penicillin in surface cultures* (pp. 57-78).—Several culture methods can be utilized to produce spores for the inoculation of production cultures. Spores for laboratory inoculations can be readily grown on agar slants or petri dish cultures. Use of dry spores mixed with a floating and spreading agent, such as whole-wheat flour, has given very satisfactory results in uniformity of surface growth and penicillin yield. In the search for a better organism for penicillin production in surface culture, none was found superior to one of the descendants of the original Fleming strain which had been freed, insofar as possible, from degenerate mutant strains. Continual precautions must be taken to guard against the appearance of these inferior forms. This special strain (NRRL 1249.B21) is now widely used for industrial production by the surface culture method. The penicillin yield produced in surface cultures by *Penicillium notatum* has been increased from 2 to 6 to over 200 units per cubic centimeter. Addition of corn steep liquor to the culture medium greatly increases the yield. Use of lactose or starch was found to give higher penicillin yields than can be obtained with glucose, sucrose, sorbitol, or glycerol. Strain NRRL 1249.B21 in a culture medium containing corn steep liquor and lactose has given penicillin yields of 190 units per cubic centimeter in 5 days; addition of nutrients during the course of the fermentation has given a further increase up to 220 units per cubic centimeter.

IX. *The laboratory scale production of penicillin in submerged cultures by Penicillium notatum Westling* (NRRL 832) (pp. 79-93).—A strain of *P. notatum*—NRRL 832 and not related to the Fleming strain—was found to give higher penicillin yields than any other fungus tested in submerged culture; this strain has been widely used in the industrial production of penicillin in tanks. The best medium for penicillin production contained lactose and corn steep liquor at about one-half the concentration found optimum for surface culture production. Penicillin yields of 112 Oxford Units per cubic centimeter have been obtained in 6 days by using a pregerminated inoculum. Some increase in penicillin yields was obtained by adding nutrients during the course of the fermentation.

Sur un facteur bactériostatique des tomates fraîches et desséchées [A bacteriostatic factor in fresh and dehydrated tomato fruit], A. SARTORY and J. MEYER (*Compt. Rend. Acad. Sci. [Paris]*, 222 (1946), No. 2, pp. 151-153).—The authors report a very active factor located principally in the pulpy pericarp, thermostable at 50° C., very soluble in ether and a little less so in chloroform, and insoluble in petroleum ether.

The cypericolous and junicolous species of Sclerotinia, H. H. WHETZEL. (Cornell Univ.). (*Farlowia*, 2 (1946), No. 3, pp. 385-437, illus. 49).—The manuscript of this taxonomic study of the species of *Sclerotinia* occurring on members of the Cyperaceae and Juncaceae "was received and edited before Professor Whetzel's death on November 30, 1944. Realizing that he might not live to see the appearance of his paper, the author made all arrangements for its publication, including a generous gift to cover the extra cost of the halftone plates." The species here discussed were the only ones known to the author on sedges and rushes that could be properly referred to the genus *Sclerotinia* as characterized by him. A number of species of the Discomycetes recorded on various species of these plants and referred to that genus were not believed by him to qualify; these insofar as known to him are listed and briefly discussed at the end of the paper. Ten species of *Sclerotinia* occurring on 41 different hosts constitute the main part of this study. These are each largely restricted to a distinct suscept or set of susceptibles; only among the 4 species on *Carex* were there found a few cases of susceptibles common to 2 or more host species. In addition to references in the text, 24 are listed at the end of the paper.

Flora of Alaska and adjacent parts of Canada: An illustrated and descriptive text of all vascular plants known to occur within the region covered.—Part IV,

Dicotyledoneae: Salicaceae (except Salix) to Caryophyllaceae, J. P. ANDERSON (*Iowa State Col. Jour. Sci.*, 20 (1946), No. 2, pp. 213-257, illus. 104).—A further installment of the manual previously noted (E. S. R., 93, p. 19).

Indiana plant distribution records, V—1944, C. C. DEAM ET AL. (*Ind. Acad. Sci. Proc.*, 54 (1944), pp. 91-99).—A continuation of the series of annual reports intended to keep Deam's "Flora of Indiana" up to date (E. S. R., 92, p. 627).

New bamboos from Szechwan Province, China, Y.-L. and P.-C. KENG (*Jour. Wash. Acad. Sci.*, 36 (1946), No. 3, pp. 76-86, illus. 3).—Four new species and one new variety are described under the genera *Sinocalamus*, *Bambusa*, and *Arundinaria*.

New Asiatic species of the legume genus Campylotropis, P. L. RICKER. (U. S. D. A.). (*Jour. Wash. Acad. Sci.*, 36 (1946), No. 2, pp. 37-40).—The author describes 12 new species.

Aquilegia: The cultivated and wild columbines, P. A. MUNZ. (Cornell Univ.). (*Gentes Herbarum*, 7 (1946), No. 1, pp. 150, illus. 38).—A taxonomic monograph involving some new nomenclature and including identification keys to the species (general and North American) and varieties.

Observations sur l'écologie du *Rhizobium leguminosarum* (Bact. radicola), A. DEMOLON and A. DUNEZ (*Compt. Rend. Acad. Sci. [Paris]*, 221 (1945), No. 11, pp. 309-311).—As a result of their study of the comparative physiology and ecology of strains of *R. leguminosarum*, the authors show that a soil population not only exhibits great variability in the density of the nodule bacteria but also in the physiological properties of individuals in the same group. These findings they discuss in relation to N-fixing activities, to the "fatigue" of soils cropped to legumes v. bacterial symbiosis, and to the use of highly effective strains for inoculating legume seed.

Effect of soluble nitrogenous compounds upon formation of nodules on roots of leguminous plants, M. C. ČAJLACHJAN and A. A. MEGRABJAN (*Compt. Rend. (Dok.) Acad. Sci. U. R. S. S., n. ser.*, 48 (1945), No. 2, pp. 138-141, illus. 1).—On the basis of experiments with soybean and bean it is concluded that the suppression of nodule formation and the penetration of the nodule bacteria into the roots is not controlled by the amount of soluble nitrogen contained in the substrate, but rather by that which has already penetrated into the plant tissues. As shown in previous studies of photoperiodism by the authors (E. S. R., 94, p. 603), agencies in the surrounding medium modify the physiological condition of the plant, and this in turn controls the susceptibility to inoculation with the nodule bacteria. A high content of carbohydrates and growth substances in the plant favors the formation of root nodules; the presence therein of a large quantity of soluble nitrates, on the contrary, acts adversely on bacterial penetration into the root cells and thus on the formation of nodules. Though in the course of their evolution the legumes have adapted their ability to a symbiosis with the nitrogen-fixing bacteria, this very nitrogen plays an outstanding role in the mechanisms of regulating in ontogeny the relations between the leguminous plant and the root-nodule bacteria.

Red, brown, and green pigments in leguminous root nodules, A. I. VIRTANEN and T. LAINE (*Nature [London]*, 157 (1946), No. 3975, pp. 25-26).—The results reported on the occurrence and significance of hemoglobin, methemoglobin, and the green pigment in root nodules are said to make possible the estimation of approximately the nitrogen-fixing efficiency of the nodules in cultivated soil simply by watching their color on the plane of intersection. If the color is red, the activity is high; if it is brown, the activity is lower and the balance lies too much on the side of methemoglobin; if the color is green, the activity is nil and the N fixation is irrevocably at an end. The names "leghemoglobin" and "legmethemoglobin" are suggested for the hemoglobin and methemoglobin of the root nodules.

Neurospora, III, IV (*Amer. Jour. Bot.*, 33 (1946), No. 1, pp. 15-20, illus. 1; pp. 31-35, illus. 2).—In continuation of the series (E. S. R., 94, p. 609), the following papers are included:

III. *Biosynthesis of thiamin*, E. L. Tatum and T. T. Bell.—Four mutant strains of this fungus requiring thiamine for growth were found to differ from the wild type by single genes. The evidence suggested that the thiazole analogs tested, and combinations of acetopropyl and chloroacetopropyl alcohols with thioformamide, are not normal precursors of thiazole in *Neurospora*, nor does the synthesis factor of Kidder and Dewey (E. S. R., 89, p. 185) have any demonstrable activity there. No apparent relation seems to exist between the type of thiamine deficiency in mutant strains and the inhibition by pyrithiamine. The utilization of cocarboxylase is inhibited to a greater extent than that of thiamine, while the utilization of thiazole is much less strongly inhibited by pyrithiamine. There are 21 references.

IV. *A temperature-sensitive riboflavinless mutant*, H. K. Mitchell and M. B. Houlahan.—It was demonstrated that one mutant (No. 51602) differs from the wild type by a single gene that normally controls a step in the biosynthesis of riboflavin. Riboflavin synthesis by it is shown to be a function of the temperature at which the fungus is allowed to grow. A brief discussion stresses the value of studies on mutations of this type in further elucidating the mechanism of gene action. It is shown that lumichrome, lumiflavin, and tissue extracts reversibly inhibited riboflavin utilization by the mutant here studied. There are 11 references.

A gravimetric method for determining the activity of growth substances, E. V. BOBKO and N. I. YAKUSHKINA (*Compt. Rend. (Dok.) Acad. Sci. U. R. S. S., n. ser.*, 48 (1945), No. 2, pp. 132-134).—By the technic presented, fragments of pea stems are weighed in weighing glasses and placed in a solution of the substance to be tested. After a certain interval they are taken out, blotted with filter paper, and again weighed. The increase in weight against the controls (in tap water) expressed in percentage of the initial weight serves as a measure of the activity of growth in the substance tested. The detailed procedure is given.

Isolation of 3-indoleacetic acid from immature corn kernels, A. J. HAAGENS MIT, W. B. DANDLIKER, S. H. WITTWER, and A. E. MURNEEK. (Univ. Mo. et al.). (*Amer. Jour. Bot.*, 33 (1946), No. 2, pp. 118-120).—On the basis of acid and base destruction tests the free auxin extractable by 95 percent ethyl alcohol from immature corn kernels and detectable by the *Avena* test consisted chiefly of 3-indoleacetic acid. The total amount was calculated to be 2.68×10^{-8} gm. per 1 gm. of kernel; 9 percent of this was isolated in crystalline form and characterized as 3-indoleacetic acid.

An analysis of the function of the leaf in the process of root formation in cuttings, J. VAN OVERBEEK, S. A. GORDON, and L. E. GREGORY (*Amer. Jour. Bot.*, 33 (1946), No. 2, pp. 100-107, illus. 12).—The combined action of auxin and factors coming from the leaves proved essential for root formation in cuttings, the leaves exerting their influence in the dark as well as in the light. In red hibiscus the root-forming factors of the leaves could be entirely replaced by sucrose and nitrogenous substances. Quantitative chemical analyses indicated that these substances are actually contributed to the cuttings by the leaves; it is therefore concluded that the main function of leaves in root initiation is to supply the cutting with sugars and nitrogenous substances, factors which may be termed nutritional. There is no a priori reason to postulate the production of a special root-forming substance such as "rhizocaline" in the leaves of red hibiscus. In cuttings of this plant—following treatment with auxin in conjunction with leaves or with suitable carbohydrate and N sources—roots were found to originate in the secondary phloem of the ray parenchyma.

A contribution to the study of heat resistance of the leaves of cotton grown on saline soils. A. KLESHNIN (*Compt. Rend. (Dok.) Acad. Sci. U. R. S. S., n. ser., 47 (1945), No. 8, pp. 587-589, illus. 1*).—By the procedure used, leaves of a definite internode are cut off and placed in a beaker of water; the temperature of the water is gradually raised to 55° C., and the leaves are kept at 55°-60° for 10 min. After this they are transferred to containers of cold water, which is replaced by 0.2 N HCl. The appearance of yellow spots under the influence of the acid is considered an index of the heat resistance; the earlier they appear, the lower the resistance of the leaves tested. Experiments with different concentrations of HCl into which the petioles of cotton leaves were dipped for 2.5 hr. indicated that the decrease in heat resistance paralleled the concentration of the salt in the medium. The heat resistance of leaves on different internodes proved of considerable significance; the maximum resistance occurred in leaves of the midinternodes; the minimum, in the lowest and uppermost leaves.

Physiological studies on sap flow in the sugar maple (*Acer saccharum* Marsh.), L. P. V. JOHNSON (*Canad. Jour. Res., 23 (1945), No. 6, Sect. C, pp. 192-197*).—Sap flow from the stumps of sugar maples was over five times as great as that from the trunks of the same trees which were detached in November, January, and March. There was no consistent variation in the sugar concentration of the sap samples drawn from stumps and trunks, but those taken from points above girdles were consistently higher in sugar than those taken from below. Sap flow is attributed mainly to the activities of living cells; it is suggested that the O₂ concentration of the sap and the release of hydrostatic pressure in tapped trees are related to cell activities. The beneficial effect of alternating cold nights and warm days on sap flow is attributed to an increase in the O₂ available to living cells through the agency of the relative solubility of O₂ in water at low and high temperatures.

The absorption by roots of rubidium and phosphate ions at extremely small concentrations as revealed by experiments with Rb⁸⁶ and P³² prepared without inert carrier, R. OVERSTREET and L. JACOBSON. (Univ. Calif.). (*Amer. Jour. Bot., 33 (1946), No. 2, pp. 107-112, illus. 3*).—Actively metabolizing barley roots were observed to accumulate radioactive Rb and PO₄ rapidly in solutions at concentrations of the order of 10⁻⁹ moles per liter (Rb⁸⁶ and P³² prepared without inert carrier). The nonmetabolic uptake of Rb and PO₄ by the roots in trace amounts was also studied. At 0° C. Rb⁸⁶ was absorbed in a form easily removed by exchange for inert isotopes in the bathing solution; P³²O₄ was absorbed nonmetabolically in a form with difficulty removable by exchange for isotopes in the outside solution. The nonmetabolic uptake of trace amounts of Rb and PO₄ is to a high degree confined to the first few millimeters from the root tip; in this region the uptake represents an accumulation in that the concentration per unit volume of tissue is greater than in the bathing solution. The application of the technic to the general problem of ion uptake is discussed.

Transplantation as applied to the study of nutrition of different plant species, A. V. SOKOLOV (*Compt. Rend. (Dok.) Acad. Sci. U. R. S. S., n. ser., 48 (1945), No. 2, pp. 135-137*).—When one plant is grafted onto another, the scion is supplied with minerals whose intake depends on the root properties of the stock. The author used this method in studying the effects of elements supplied in the nutrient solution, using grafts in either direction between peas and lupines.

The growth of yeast 6479 in ternary mixtures of various nitrogen nutrients, R. S. W. THORNE (*Jour. Inst. Brewing, 52 (1946), No. 1, pp. 5-14, illus. 9*).—Recent work indicated that, as a rule, the mixing of two N nutrients is accompanied by a certain enhancement of yeast growth and fermentation. Experimental observation of yeast growth in graded mixtures of three N nutrients lent support

to the theory that a still further increase in the number would have a greater effect, since there was actually a progressive increase in the growth characteristics of the yeast under these conditions. The average magnitude of these enhancements (about 8 percent more than the corresponding binary mixtures) suggested that further increases in the number of nutrients would give rise to progressively smaller and smaller enhancements, approaching a limit perhaps in the neighborhood of 50 percent.

A yeast growth inhibitive effect exhibited by tyrosine and glycine, R. S. W. THORNE (*Jour. Inst. Brewing*, 52 (1946), No. 1, pp. 15-16, illus. 1).—It was shown in the paper noted above that mixing N sources generally induces improved growth and fermentation by yeast. This note records the only exception thus far met with, viz, the case of tyrosine mixed with glycine.

Studies on the physiology of the germination of pollen.—I, **Mutual stimulation in the germination of pollen grains**, I. N. HOLUBINSKY (*Compt. Rend. (Dok.) Acad. Sci. U. R. S. S., n. ser.*, 48 (1945), No. 1, pp. 62-63).—In the 15 species of plants tested there was a clear correlation between the number of pollen grains in a drop of sugar solution and the percentage of germination and length of the pollen tubes; in view of the fact that these plants belonged to 14 genera in 11 families, it is believed justifiable to assume that such a stimulation exists in the angiosperms in general and that it will also occur during germination on the plant stigma. It is concluded that in breeding work an excess of pollen should be used.

Respiration and cell division in plants.—I, **Oxygen consumption and cell division in the leaves of *Ligustrum lucidum* and *Hedera helix***, A. V. BEATTY (*Amer. Jour. Bot.*, 33 (1946), No. 2, pp. 145-148, illus. 2).—Using young leaves of these two species, the author determined the number of mitoses at hourly intervals and prepared graphs showing mitotic frequency plotted against time. Counts—by the sampling method—were also obtained from three acetocarmine preparations of millimeter disks of leaf tissue. The consumption of O_2 was determined for the same period of time, and graphs were made showing the amount consumed per gram of wet leaf tissue plotted against time; the values for each hour were obtained by averaging the readings from four leaves. In each species the graphs showing O_2 consumption and mitotic frequency exhibited common characteristics indicating a correlation between the two processes. There are 23 references.

Respiration, II, W. STILES (*Bot. Rev.*, 12 (1946), No. 3, pp. 165-204).—From this contribution (76 references) covering research published during the 10 yr. since the previous review (*E. S. R.*, 74, p. 463) it will be seen that workers on plant respiration have been very active, and particularly on the mechanism of the respiratory processes. Other phases taken up are nomenclature and methods, drifts of respiratory activity, environal effects, the respiratory activity of different tissues, respiration in plants of various types, the effect of mechanism stimuli on the respiratory mechanism, and anaerobic respiration, the Pasteur effect, and anabolism.

Torsion in protoplasm, W. SEIFRIZ (*Jour. Colloid Sci.*, 1 (1946), No. 1, pp. 27-32, illus. 1).—"A delicate glass needle suspended in a horizontal position on the end of a freely hanging strand of myxomycete protoplasm swings alternately to the right and to the left through an arc of about 40° when the protoplasm is in a state of flow. The swing of the needle is the result of a twisting of the living thread brought about by streaming of the protoplasm. As a result of the spiral twist produced by streaming, a state of torsion is set up in the protoplasm. The period of swing of the needle is half the period of rhythmic flow in one direction. That the period of swing is but one-half the period of flow is due to a gradually increasing force brought about by increase in rate of flow up to the mid point of movement in one direction, after which there is a gradual lessening in the force applied and a consequent unwrapping of the protoplasmic thread. A molecular interpretation of the structural basis of spiral form and movement in protoplasm is given, based on the known asymmetry of molecules."

A note on the rate of morphogenetic movement in the slime mold, *Dictyostelium discoideum*, J. T. BONNER and D. ELDREDGE, JR. (*Growth*, 9 (1945), No. 4, pp. 287-297, illus. 3).

Contribution à l'étude cytologique de *Penicillium notatum* Westling, B. DELAPORTE and A. SACCAS (*Compt. Rend. Acad. Sci. [Paris]*, 222 (1946), No. 3, pp. 196-198).

Relation between seeds and pericarp in the process of fruit growth and ripening, J. V. RAKITIN (*Compt. Rend. (Dok.) Acad. Sci. U. R. S. S., n. ser.*, 47 (1945), No. 8, pp. 590-592).—The observations presented led the author to believe that the fundamental regularities typical of the development of seed-bearing fruits are the ultimate expression of the interrelations existing between seed and pericarp, and that a correct understanding of the characteristics of growth and maturation in fruits arising parthenocarpically is not possible without a clear knowledge of the regularities peculiar to seed-bearing fruits.

De terminologie van de bloemaanleg der bloembolgewassen (The terminology of the flower development in bulbous plants), J. J. BEYER (*Lab. Bloembollen Onderzoek, Lisse*, No. 68 (1942), pp. 16; *Eng., Ger. abs.*, pp. 13-15).

Growth and vascular development in the shoot apex of *Sequoia sempervirens* (Lamb.) Endl.—III, Cytological aspects of vascularization, C. STERLING. (Univ. Calif.). (*Amer. Jour. Bot.*, 33 (1946), No. 1, pp. 35-45, illus. 10).—In continuation (E. S. R., 94, p. 40), it is stated that "few reports have been concerned with the course of cambial development from its initiation at the growing point. The present paper attempts to portray this ontogeny as it occurs in the shoot of *S. sempervirens*."

A study of the stomate in sugarcane, L. H. FLINT and C. F. MORELAND. (La. State Univ.). (*Amer. Jour. Bot.*, 33 (1946), No. 1, pp. 80-82, illus. 17).—Studies of the red rot have included researches on hyphal penetration of the epidermal cells of sugarcane leaves and of the fungus fruiting structures occupying cells in the stomatal region. In the course of this work it became evident that the sugarcane stomate was appreciably more differentiated than those of the grasses; further investigation yielded the results here described and illustrated.

Epidermal characters in *Fraxinus*, J. W. WRIGHT. (Purdue Univ.). (*Ind. Acad. Sci. Proc.*, 54 (1944), pp. 84-90, illus. 8).—The identification of eastern American species of ash is often difficult. Particularly hard to separate are leaves of *F. biltmoreana* and *F. tomentosa*, as well as entire or nearly entire specimens of *F. americana* and *F. pennsylvanica lanceolata*. These species may be easily differentiated by certain microscopic characters of the lower epidermis; as such criteria appear not to have been used heretofore, they are here described and illustrated in detail.

Studies in the developmental anatomy of *Phlox drummondii* Hook.—III, The apices of the mature plant, H. A. MILLER and R. H. WETMORE (*Amer. Jour. Bot.*, 33 (1946), No. 1, pp. 1-10, illus. 12).—In this concluding section (E. S. R., 94, p. 608), attention is directed to the developmental changes in those parts of the older plant in which there is retention of meristematic activity, viz., the vegetative, floral, and root apices. A topographical interpretation is suggested for the primary tissue systems of the vascular plants.

GENETICS

The improvement of naturally cross-pollinated plants by selection in self-fertilized lines.—IV, Combining ability of successive generation of inbred sweet corn, W. R. SINGLETON and O. E. NELSON, JR. (*Connecticut Station Bul.* 490 (1945), pp. 458-498, illus. 21).—In the autumn of 1934, 48 ears of several different types were selected from a grower's stock of Whipple Early Yellow. In 1935 one self-

pollination was made in each line and pollen from the selfed plant was put on Purdue 39, a uniform sweet corn inbred.

In 1936 the seed from the selfed ears was again grown and the process repeated. Preliminary observation rows of the hybrids P39 $\times$ Whipple lines O P were grown in 1936 and again in 1937 along with P39 $\times$ Whipple lines selfed once. In 1936 and 1937 hybrids were selected on the basis of yield, vigor, appearance, and uniformity of the ears. In 1938 the inbreds grown were reduced to 10, and 4 generations of each were grown for observation. In all the lines tasseling was earlier than silking, although in some the difference between tasseling and silking was greater than in others. The lines became slightly later upon inbreeding. The standard deviation for tasseling did not decrease upon inbreeding but tended to increase somewhat, indicating that the lines were as variable for tasseling at the end as at the beginning.

Height of all lines decreased rapidly in the first and second generations of inbreeding. There was a rise in height from the second to the third generation, due apparently to selection of the more thrifty plants in the second inbred generation. Standard deviation for height decreased as inbreeding was continued, suggesting that the lines were becoming more uniform for height. All lines became fixed for tillering fairly early in the inbreeding program.

The 10 Whipple lines in four generations of inbreeding were crossed by Purdue 39. Considering all varieties, selection within inbred lines was effective in raising combining ability significantly from the open-pollinated ear to the third inbred generation. A large part of the yield increase is due to an increase in the mean length of ear when outcrossed with P39. Since there was no correlation between yield of the open-pollinated generation and the third inbred generation or between the first and third, or second and third, it was not possible to detect combining ability in generations earlier than the third of selfing.

Since it appears necessary to inbreed for at least three generations before testing, inbreds should be obtained by the most direct method with the least amount of labeling of individual lines. This suggests the use of the nonindividual pedigree method of inbreeding.

Altérations du développement et de la maturation du Zea mays var. polysperma par l'action de la colchicine, L. BLARINGHEM and G. CHEVALIER (*Compt. Rend. Acad. Sci. [Paris]*, 221 (1945), No. 11, pp. 267-271).

Genotype and temperature in relation to symptoms caused in Nicotiana by the mosaic virus, H. H. MCKINNEY and E. E. CLAYTON. (U. S. D. A.). (*Jour. Hered.*, 36 (1945), No. 11, pp. 322-331, illus. 6).—Seven species carrying the necrosis factor (*N*) were inoculated with the tobacco mosaic virus and then cultured at several temperatures. Except possibly for *N. repanda*, each species carried one or more factors for mosaic susceptibility, the presence of which was apparent only at temperatures above those favoring severe secondary necrosis. When the *N* factor was transferred to plants carrying the mosaic-resistance factors from Ambalema and T. I. 448 tobaccos, secondary necrosis at high temperatures was greatly reduced or eliminated and mosaic was much reduced. Since it is apparent that the transfer of the *NN* gene from *N. glutinosa* to *N. tabacum* involves an entire chromosome, it is yet not clear that lines carrying the *N* factor are superior to those carrying the mosaic-resistance factors from Ambalema or T. I. 448 tobaccos.

Interspecific hybridization in Parthenium.—II, Crosses involving P. argenteatum, P. incanum, P. stramonium, P. tomentosum, and P. hysterophorus, R. C. ROLLINS (*Amer. Jour. Bot.*, 33 (1946), No. 1, pp. 21-30, illus. 15).—A continuation of this series (E. S. R., 93, p. 699).

Studies of a genetic disease of Trifolium repens simulating a virosis, S. S. ATWOOD and K. W. KREITLOW. (U. S. D. A. et al.). (*Amer. Jour. Bot.*, 33 (1946), No. 2, pp. 91-100, illus. 3).—When a selected white clover plant exhibiting a severe

mottling of its leaf blades—suggesting the symptoms of a virosis—was crossed with an unrelated healthy plant, the F_1 segregated into 12 mottled and 33 healthy. A total population of 4,193 plants from various backcrosses (B), F_2 , and F_3 families was classified in the greenhouse; all segregations were well defined, with no cases of intermediate injury. Ratios of 9:7, 3:1, 3:5, 1:3, and no segregation were obtained in different families, depending on the genotypes. Most of the ratios fitted the expected closely; in general, however, there was a deficiency of mottled plants—particularly in the families segregating 9:7 or 3:5. These findings are explainable by assuming two independent dominant factors, both of which must be present for development of the necrotic lesions. Evidence from B, F_2 , and F_3 families suggested that the abnormal and healthy plants bearing the largest number of dominant factors tended to be lethal, but no significant differences in stand were obtained among the several segregating ratios. The number of leaves at the age of 6 weeks was used as a measure of vigor; the 1,673 healthy B and F_2 individuals averaged 8.97 leaves per plant and the 605 abnormal plants 4.76, the difference between these averages being highly significant. The differences in average number of leaves were also highly significant between the different segregating ratios among both healthy and abnormal types. These averages were inversely correlated ($r = -0.944$) with the number of dominant factors borne by the different classes, indicating a highly significant dosage effect caused by the same genes that conditioned the mottling but with the dosage effect superimposed on the sharply bilateral segregation observed with presence or absence of mottling. All attempts to transmit the mottling by inoculating or grafting were unsuccessful, giving further evidence that the agent was not a virus. This condition is of interest as another example of the fact that some heritable factors may induce types of morphological response similar to those induced by certain disease agents.

Inheritance in *Begonia semperflorens*, W. D. HOLLEY. (Univ. N. H.). (*Amer. Soc. Hort. Sci. Proc.*, 46 (1945), pp. 389–396, illus. 3).—In four separate crosses between double and single parents the progeny was all single flowered, indicating that doubleness is recessive. Crosses between doubles and semidoubles fitted for the most part into a 1:1 ratio. In only one instance did singles appear among the progeny. Genotypically, there are apparently several different semidoubles and the same may be true of doubles. Temperature, available plant food, season, and possibly other factors contribute to the degree of doubleness in the semidouble group. No evidence was obtained that doubleness is sex-linked. When seedlings from crosses between doubles and semidoubles were graded into large and small plants at the time of transplanting, there was found a higher percentage of doubles in the larger plots.

As to color inheritance, both parents must be pure reds to produce red hybrid. To produce white, both parents must be pure white. Pink varieties may be obtained by crossing a pure red and a pure white. To obtain 100 percent of dark foliage hybrids, one of the parents must be pure for the factor governing dark foliage. The possibilities in the production of hybrid seed are discussed.

Inheritance in the carnation.—V, Tetraploid carnations from interspecific hybridization, G. A. L. MEHLQUIST. (Univ. Calif.). (*Amer. Soc. Hort. Sci. Proc.*, 46 (1945), pp. 397–406, illus. 3).—In nearly 700 first-generation hybrids obtained from crosses between the tetraploid *Dianthus chinensis*, $2n = 60$, and diploid carnations, $2n = 30$, there occurred one fertile tetraploid with all others triploid and sterile. The fertile tetraploid hybrid behaved as a relatively stable amphidiploid. Tetraploid backcross derivatives three generations removed from the F_1 appeared like autotetraploid carnations. These are self- and inter-fertile but set very few seeds when pollinated by either the tetraploid *D. chinensis* or diploid carnations. The new tetraploids are believed to have commercial possibilities and may serve as the basis for many more combinations.

Double fertilization in petunia, D. C. COOPER. (Wis. Expt. Sta.). (*Amer. Jour. Bot.*, 33 (1946), No. 1, pp. 54-57, illus. 10).—"The mature embryo sac of the garden petunia is a seven-celled structure consisting of three shrunken antipodals, a three-celled egg apparatus, and a large endosperm mother cell. The two polar nuclei usually fuse prior to fertilization. Fertilization occurs in the apical ovules of the ovary approximately 24 hr. after the open flower stage and the basal ones are being fertilized at 32 hr. Double fertilization takes place in the usual manner, and the entire endosperm is triploid from its inception. Two 'x-bodies' remain in the tip of the pollen tube following discharge of the male gamete nuclei."

Recent genetical experiments with yeasts, E. R. SANSOME (*Nature [London]*, 157 (1946), No. 3976, pp. 52-53).—A brief review (eight references) of recent studies on life histories, segregation, cytoplasmic effects, and mutation.

A new mutant of *Saccharomyces cerevisiae*, M. K. SUBRAMANIAM and B. RANGANATHAN (*Nature [London]*, 157 (1946), No. 3976, pp. 49-50, illus. 1).

Peculiar cytological behaviour of a distillery yeast, M. K. SUBRAMANIAM and B. RANGANATHAN (*Nature [London]*, 157 (1946), No. 3976, pp. 50-51, illus. 1).—An unusual chromosomal behavior.

Inheritance of reaction to crown rust and stem rust and other characters in crosses between Bond (*Avena byzantina*) and varieties of *A. sativa*, S. Y. KO, J. H. TORRIE, and J. G. DICKSON. (Wis. Expt. Sta. coop. U. S. D. A.). (*Phytopathology*, 36 (1946), No. 3, pp. 226-235, illus. 1).—The mode of inheritance of reactions to crown rust (*Puccinia coronata avenae*) and stem rust (*P. graminis avenae*), several kernel characters, and earliness among crosses of several varieties of *A. sativa* with Bond (*A. byzantina*) was studied. The segregation found for crown rust reaction in all crosses except Bond × S. D. 334 could be explained by either the hypothesis of two complementary factors carried by Bond or of two factor pairs—S for crown rust resistance and I which partly inhibits the expression of S. Plants heterozygous for both factor pairs were more susceptible in the field than in the greenhouse. A single factor pair with dominance of resistance governed stem rust reaction. In the cross Bond × Hawkeye the characters of basal hair length and number, basal articulation, rachilla attachment, lemma color, awnness, and twisted black base of awn were monogenic and linked; in the cross Bond × S. D. 334 the same kernel characters were digenic and linked. A partial dominance of earliness of heading occurred in the cross Bond × Hawkeye; in the cross Bond × S. D. 334 lateness of heading was dominant over early heading.

Animal cytology and evolution, M. J. D. WHITE (*Cambridge, [Eng.]: Univ. Press*, 1945, pp. 375+, illus. 121).—The elements of cytology are briefly, thoroughly, and clearly reviewed.

[Genetic studies with livestock by the Bureau of Animal Industry]. (Partly coop. Mont. Expt. Sta. et al.). (*U. S. Dept. Agr., Bur. Anim. Indus. Rpt.*, 194^f, pp. 5-6, 10-11, 16-18, 19, 20-21; also in *U. S. Dept. Agr., Agr. Res. Admin. Rpt.*, 1945, pp. 53-54, 58-59, 64-66, 67, 68-69).—Brief results are given of genetic studies, largely in continuation of those previously noted (E. S. R., 92, p. 777), on differences in meat quality of steers of different parentage, differences in efficiency and desirability of beef production by steers produced by different parents, heritability of mutton and wool characters of Rambouillet sheep, breeding skin folds out of Rambouillet sheep, effect of various conditions on traits of Rambouillet sheep, avoidance of overshot jaws in breeding sheep, increasing egg production of Rhode Island Red and White Leghorn hens by crossing inbred lines, increasing egg production of Beltsville Small White turkeys by individual and family selection, increasing consumer preferences by improving percentage of thick white and eggshell quality by reducing blood spots in eggs through heredity, developing inbred lines

of chickens resistant to lymphomatosis, and laboratory tests which simulate conditions of air travel for hatching eggs.

[Genetics studies with dairy cattle by the Bureau of Dairy Industry] (*U. S. Dept. Agr., Bur. Dairy Indus. Rpt., 1945, pp. 7-9, 11-12, 15-17; also in U. S. Dept. Agr., Agr. Res. Admin. Rpt., 1945, pp. 105-107, 109-110, 113-115*).—Studies along this line were conducted with dairy cattle, especially on use of proved sires for building a higher level of inheritance, the level of production in farm herds raised by the sons of proved sires, linebreeding and outbreeding equally effective in developing high-producing herds, selecting calves on the basis of mammary development, low-producing cows have smaller thyroid glands, dairy herd improvement progresses with more supervisors available, high-producing herds produce butterfat cheaper, sires proved with association records, and outstanding sires proved by cooperative breeding associations.

Artificial breeding of dairy cattle as a practical procedure for the general practitioner. E. L. SHUFORD (*North Amer. Vet., 27 (1946), No. 1, pp. 17-21, illus. 5*).—Methods are outlined which may be followed by the veterinarian in carrying out artificial insemination and the avoidance of many cases of failure to breed.

Artificial insemination of cows, W. L. HINDMARSH and R. FARKAS (*Austral. Vet. Jour., 21 (1945), No. 4, pp. 95-99*).—A description of the conduct of artificial insemination in cows, with details of carrying out an artificial insemination ring.

The multinipple trait in sheep, R. W. PHILLIPS, R. G. SCHOTT, and D. A. SPENCER. (*U. S. D. A.). (Jour. Hered., 37 (1946), No. 1, pp. 19-26, illus. 4*).—In a study of Bell's multinipple flock (*E. S. R., 50, p. 331*), the incidence of the multinipple trait in sheep was shown to be readily increased or decreased by selection of sires and dams. There is little indication that either high fertility or increased milk production is associated with the trait, and in most flocks this condition can be safely disregarded. If the incidence of multinipple individuals becomes high enough to be objectionable, it should be possible to bring it under control quickly by the use of rams with only two rudimentary nipples. In Bell's flock from about 1895 to 1925, the average number of multinipples increased from about two to six.

Heritability of type and condition in range Rambouillet lambs as evaluated by scoring, L. N. HAZEL and C. E. TERRILL. (*U. S. D. A.). (Jour. Anim. Sci., 5 (1946), No. 1, pp. 55-61*).—The heritability of mutton conformation and degree of fatness were estimated from the half-sib correlations and intrasire regressions of offspring on dam from data on 2,183 range lambs and 892 dam-offspring pairs. The averages of eight estimates indicated that type was about 13 ± 4 percent and condition about 4 ± 3 percent heritable. It seems with the low heritability of these traits that more emphasis should be placed on other more highly heritable traits and relatively less on type and condition in the development of a sound breeding program of improvement of sheep.

Heritability of growth and efficiency in beef cattle, B. KNAPP, JR., and A. W. NORDSKOG. (*U. S. D. A. and Mont. Expt. Sta.). (Jour. Anim. Sci., 5 (1946), No. 1, pp. 62-70*).—Study was made of the records of 177 steers produced by 23 sires at the U. S. Range Livestock Experiment Station, Miles City, Mont. The relative effects of heredity on weights, gains, and efficiency of production were estimated from the intrasire correlations obtained by an analysis of variance and the sire progeny regression obtained by covariance analysis. The heritabilities obtained from intrasire correlations for the various weights and gains were birth weight 23 percent, weaning weight 12, final feed lot weight 81, gain in feed lot 99, and efficiency of gain 75 percent. The sire : progeny would indicate heritability obtained from the sire to be birth weight 42 percent, weaning weight 0, final weight 69, daily gain 46, and efficiency of gain 54 percent. After adjusting for differences in feeding for sires each year, the heritability was found to be birth weight 34

percent, weaning weight 30, final weight 94, daily gain 97, and efficiency of gain 48 percent. These estimates of heritability seem higher than is reasonably possible, the causes for which are not known. Meanwhile, the breeder and feeder of beef cattle may take encouragement for selection of cattle for rate of gain and efficiency of feed utilization.

Effectiveness of selecting for rapid and for slow growth rate in Hampshire swine, J. L. KRIDER, B. W. FAIRBANKS, W. E. CARROLL, and E. ROBERTS. (UNIV. ILL. coop. U. S. D. A.). (*Jour. Anim. Sci.*, 5 (1946), No. 1, pp. 3-15, illus. 1).—The mean weights at birth, 21, 56, 150, and 180 days are presented for 749 Hampshire pigs from 98 spring litters sired by 41 boars during four generations of selection for rapid and slow growth in two lines. The effectiveness of selection or heritability of growth rate was estimated (1) directly from the line differences resulting from the selection practiced and (2) indirectly from the portion of the variance within line and year due to heritable differences between sires.

Selection for rapid or slow growth rate at 5 or 6 mo. of age was one-sixth to one-fifth as large as would have been expected if the differences in growth rate were completely heritable. This estimate is less than indicated by the results of the first generation and corresponds to the lower limits of heritability estimates reported in the literature based on studies of the association between relatives. Variance analyses within lines and years indicated that heritable differences in weight increased steadily from 5 percent at birth to 24 percent at 180 days, whereas the percentage of variance due to nonheritable differences between litters decreased from 40 percent at birth to 14 percent at 180 days. From 46 to 62 percent of the variance in weight at all ages was accounted for by nonheritable variation among litter mates. The results support the findings of Nordskog et al. (*E. S. R.*, 92, p. 35) that the heritability of weight for age increases steadily with age, while the influence of litter environment (maternal) decreases. Heritability estimates are higher for 180-day than for 150-day weight, both from line differences resulting from selection and from the analysis of variance similar to the results reported by Nordskog et al. Growth rate up to market weight is represented more by 180-day weight than by 150-day weight. Therefore, the 180-day weight is preferred to the 150-day weight as a measure of growth rate in the selection of breeding stock. However, because of the ranting in boars and certain other conditions, it may be desirable to use weight at an earlier age. Many of the statistical formulas and treatments were supplied by G. E. Dickerson of the Regional Swine Breeding Laboratory.

Hybrid vigor in single crosses between inbred lines of Poland China swine, G. E. DICKERSON, J. L. LUSH, and C. C. CULBERTSON. (Iowa Expt. Sta. coop. U. S. D. A.). (*Jour. Anim. Sci.*, 5 (1946), No. 1, pp. 16-24, illus. 1).—The carcass quality and dimensions of single crosses between inbred lines of Poland Chinas were compared with those of inbreds produced by the same boars.

The 28 intrasire comparisons included 56 inbred litters from 11 lines and 60 single-cross litters representing 43 different combinations of fall litters from 1942 and 1943. The inbreeding averaged 42 percent for inbreds and 6 percent for single crosses. The corresponding averages for inbreeding of the dams were 34 and 28 percent, and for the age of the dams 18 and 17 mo., respectively. Hybrid vigor or its converse (inbreeding) had a greater effect on viability than on rate of growth. However, faster growing pigs were more likely to survive. Mortality before and after birth was lower in crosses than in inbreds. At 5 mo. of age crosses exceeded inbreds by 1.4 live pigs per litter. Although both groups were suckling inbred sows, the crosses were a little heavier than inbreds at birth and at 21 days, and at 56 days the crosses averaged 3.4 lb. heavier and by 25 lb. at 154 days of age. With the differences in litter size the total litter weights of crosses at this age exceeded

inbreds by 290 lb. Although the crosses grew more rapidly, both crosses and inbreds required as much feed per 100 lb. of gain from 84 days to 225 lb. Crosses seemed to have a lower dressing percentage and less fat, but plumper hams, than inbreds. More careful selection must be practiced to maintain litter size and viability than to hold rate of growth. The performance of single crosses with dams inbred 28 percent averaged about the same as other outbred Poland China station herds. This fact suggests that the selection practiced in the development of these lines has effected considerable improvement, and using the best of such improved lines in top crossing on outbred sows or in the triple crosses offers opportunity for spacing the performance of outbreds.

The United States Morgan Horse Farm: Its work and its objectives, R. W. PHILLIPS. (U. S. D. A.). (*Morgan Horse Mag.*, 5 (1946), No. 2, pp. 29, 40-45, illus. 8).—The breeding program is reviewed, including descriptions of the pedigree and breeding of outstanding stallions, training devices and pasture investigations, and work with other types of livestock at the farm.

On the bicolor gene in dog, Ö. WINGE (*Compt. Rend. Lab. Carlsberg, Sér. Physiol.*, 24 (1946), No. 11, pp. 125-132).—The results in 10 English Setter studbooks showed that in matings of black-and-whites with their own type there were produced 147 black-and-white, 37 tricolor, 22 red-and-white, 6 liver-and-white, and 5 yellow-and-white dogs. Here tricolor seems recessive to $c^b c^b$, segregated by the dominant Cc^b . Pairing tricolored setters produced 17 black-and-white, 84 tricolor, 18 red-and-white, 1 liver-and-white, and 8 yellow-and-white. There were produced in matings of tricolors with black-and-white, 188 black-and-white, 151 tricolor, 25 red-and-white, 5 liver-and-white, and 7 yellow-and-white. Gordon Setter $\times$ English Setter was black $BEECc^b Tl(i?)$. Obviously there are several alleles of C besides c^b , namely, c^* , which limits black to a saddle-formed or blanketlike area on the trunk, whereas the rest of the animal is tan. Designations of other supposedly new alleles are presented.

A blueprint of the Collie, M. G. DENLINGER (*Washington, D. C.: Denlinger's*, 1945, pp. 96, illus. 16).—A brief description of points of differences between breeds of Collies.

The "snowy belly" mouse: A dominant allele of the agouti series in the house mouse, O. N. EATON and E. SCHWARZ (*Jour. Hered.*, 37 (1946), No. 1, pp. 31-32).—Another double allele in the agouti series of mice, as described by Keeler (E. S. R., 65, p. 650), is noted. It is designated as "snowy belly," for which the symbol A^s is suggested. The color of this individual is ochraceous suffused with black. The back is much lighter agouti than that of A^w or A . The underside is pure white. The F_1 and F_2 progeny from this mouse, mated to light-bellied (A^w), gray-bellied (A), and black (aa) $\varnothing \varnothing$, suggest that snowy belly is dominant to A^w and lower alleles in the agouti series. The conclusions obtained are based on 758 individuals produced in the crosses and backcrosses.

Value of the sisters' performance in selecting breeding cockerels, A. B. GODFREY. (U. S. D. A.). (*Poultry Sci.*, 25 (1946), No. 2, pp. 148-156).—A study of 652 sires on farms of U. S. R. O. P. (Record of Performance) breeders of White Leghorn, Rhode Island Red, White Plymouth Rock, Barred Plymouth Rock, and New Hampshire breeds, where the sires had at least 20 sisters and daughters as U. S. R. O. P. candidates, and 21 Beltsville sires having an average of 48 unselected daughters trapnested indicated that a minimum of 20 daughters will predict the sire's daughters' performance. Neither the production of a cockerel's full sisters nor the production of his dam is as reliable a basis for predicting the production of his daughters as the production of his full and half sisters. In most cases the families of the full sisters entered as candidates for U. S. R. O. P. are too small and the individuals too highly selective to be used in predicting the breeding per-

formance of their brothers. Representative daughters should be trapnested for selecting cockerels. Differences in breeds, strains, and environmental conditions affect egg production of the pullets more than that of their sire's sisters. Many breeders of low-producing flocks should replace their entire flocks with high-producing birds. The rate and persistence of production of a male's sisters are significantly related to the performance of his daughters. A sib-test record on a hen-housed basis is at least as reliable as one on a hen-survival basis.

Inheritance of sexual maturity in male chickens and turkeys, F. W. LORENZ and I. M. LERNER. (Univ. Calif.). (*Poultry Sci.*, 25 (1946), No. 2, pp. 188-189).—As Jones and Lamoreux (E. S. R., 87, p. 364) found differences as to the age of sexual maturity in two strains of fowls, tests were conducted on the hereditary nature of the age of sexual maturity in chickens and turkeys. Limitations of material on chickens were threefold, (1) the males were culled at 6 weeks, greatly reducing the number of full brothers per family, (2) culling was largely based on physical development and appearance, so that the sample was by no means random although it must be recognized that this type of culling would operate to minimize genetic differences, and (3) the first trials were operated at an age when a considerable portion of the cockerels had already attained sexual maturity. By correcting for hatching date and age, arbitrary ages were assigned to cockerels from 1 to 4, and the rest of the birds in the study were subjected to trials once a week until the 255 cockerels of the original 260 yielded semen at 30 weeks of age. A total of 237 cockerels originating from 17 sires and 79 dams resulted. The complete analysis of variance does not make it evident that any heritability is operated because of the limitations of the data. However, the ratio of variance between cockerels by different sires to that within sires definitely indicates that the character studied has a hereditary basis. The only alternative explanation to this distribution of variance would be that a maternal effect combined with a high degree of uniformity in the mates of each sire exists. This seems unlikely. A similar series was conducted on 67 toms with ages from the first appearance of semen of 137 to 293 days. The small number limited the analysis, but there seems little doubt of the hereditary nature. Age at first semen production is inherited in both chickens and turkeys.

Sex identification in baby chicks of "red" varieties, R. G. JAAP. (Okla. Expt. Sta.). (*Poultry Sci.*, 25 (1946), No. 2, pp. 185-186).—The accuracy of correct sex identification at hatching was 92.5 percent when the web area of the dorsal wing surface was used in sexing 103 chicks. The sex of 216 chicks was identified with an accuracy of 92.6 percent. Male chicks were required to have a relatively large white spot in the web region of the dorsal wing surface. The accuracy of sex identification was increased to 94.9 percent in 315 chicks by mating those whose dorsal surface color was uniform over the entire area. In a very light strain of New Hampshires the sex of 86.5 percent was correctly identified. It is suggested, for those who wish to improve sex identification in these two red-colored strains, that only those chicks having larger white areas on the dorsal surface of the wing web be saved. The general color tone does not need to be dark, but should be distinctly pigmented and uniform in both sexes. The head should be as deeply pigmented as the back. Chick sexors using the cloacal method and immediately changing to the color method for sex identification in Rhode Island Reds obtained an accuracy above 90 percent.

Color sexing of day-old Brown Leghorns, J. W. MACARTHUR and J. J. MACILRAITH (*Poultry Sci.*, 25 (1946), No. 2, pp. 180-183, illus. 2).—Sexing by color of 120 Brown Leghorn chicks at hatching showed that successful color sexing in this breed is based on marked sexual differences in the characteristic wild type down pattern of stripes on the crown, neck, back, face and also upon the down color

along the edge and below the wing front. In day-old chicks and throughout the down period the series of stripes is better developed, more deeply pigmented, and more sharply defined in pullets than in cockerels. The pullets are usually darker shades, while the cockerels are lighter in color and have narrower stripes.

Induction of estrus in lactating sows with equine gonadotropin, H. H. COLE and E. H. HUGHES. (Univ. Calif.). (*Jour. Anim. Sci.*, 5 (1946), No. 1, pp. 25-29).—A total of 42 sows of the Poland China, Berkshire, and Duroc Jersey breeds were injected with about 1,000 International Units of equine gonadotropin during lactation to induce estrus. The sows injected early in lactation (1 to 38 days) did not manifest estrus regularly, but 26 of 27 sows injected in the thirty-ninth to sixty-eighth days came into heat 3 to 7 days later. Twenty of 23 of the sows on which information is available became pregnant.

Effects of thiouracil on the mammary gland, J. F. SMITHICORS. (Cornell Univ.). (*Soc. Expt. Biol. and Med. Proc.*, 59 (1945), No. 2, pp. 197-200, illus. 2).—In studies with 85 ♂ and ♀ rats, part of which were castrated or thyroidectomized, thiouracil treatment produced no differences in the mammary glands. The thiouracil was administered for 18 to 35 days in aqueous suspensions in daily doses of 10 mg. per 100 gm. of body weight or in the drinking water as a 0.1-percent solution. When thyroxin was given with thiouracil and estrogen for 10 days the mammary glands resembled those from rats receiving estrogen alone.

Influence of thiouracil on growth and fattening in broilers, F. N. ANDREWS and E. E. SCHNETZLER. (Ind. Expt. Sta.). (*Poultry Sci.*, 25 (1946), No. 2, pp. 124-129, illus. 1).—Thiouracil at levels of 0.025, 0.05, 0.10, and 0.20 percent had a progressively increasing effect on the weight and microscopic anatomy of the thyroid gland of the chicken when it was fed between the sixth and fourteenth weeks of age. The average thyroid weight increase at the 0.20-percent level, approximated 20 times normal, and in one case was 70 times normal, but no toxic effects were observed grossly or by histopathologic study of the liver and kidney. The body temperature was slightly raised. Growth was retarded but not significantly except in ♂♂ when artificial light was used during the night. Market grade and fat deposition were improved by thiouracil, although the treated birds made less gain and efficiency of feed utilization was greater when adjusted for gain by the analysis of covariance.

Effect of rape seed on the thyroid of the chick, C. W. TURNER. (Mo. Expt. Sta.). (*Poultry Sci.*, 25 (1946), No. 2, pp. 186-187).—Since Kempster and Turner (E. S. R., 92, p. 825) reported that the addition of 0.2 percent thiouracil to rations of New Hampshire broilers greatly improved the market grade during 16- to 36-day fattening periods, it was of interest to compare the goitrogenic effects of varying amounts of ground rape seed in comparison with thiouracil in fattening rations of broilers. Groups of 10 to 11 chicks each received additions of 5, 10, 20, and 40 percent ground rape seed or 0.1 percent thiouracil to chick starter rations for a 3-week period, at the end of which the thyroids were weighed. It was only at the 40-percent level that rape seed caused thyroid hyperplasia. With 1 percent thiouracil, enlargement of the thyroid was almost twice that produced by 40 percent rape seed and five times that on the lower levels. Even at the 40-percent level rape seed would probably be a poor substitute for thiouracil for fattening broilers.

Rapid assays to determine the fattening potency of orally administered estrogens in birds, R. G. JAAP. (Okla. Expt. Sta.). (*Okla. Acad. Sci. Proc.*, 25 (1945), pp. 37-38).—In the chick oviduct test, ♀♀ baby chicks were fed estrogenized feed for 16 days after hatching and were killed on the seventeenth day, after which the oviducts were weighed and found to correlate closely with actual fattening trials. The feather color test was made with a mature Brown Leghorn cockerel or capon. The black breast feathers were plucked and the estrogen administered during

growth of the new feathers. The growing part of these feathers became salmon colored. The width of the salmon bar demonstrated the length of time the body had been under the influence of the estrogen. The weight was determined on young chicks after feeding estrogen, and the androgen stimulation on comb size was suppressed in carrying out the comb test.

Effect of roentgen rays on bone growth in pigeons, I. J. COLE. (Wis. Expt. Sta.). (*Jour. Expt. Zool.*, 100 (1945), No. 3, pp. 487-495, *illus.* 1).—The growth of bones in the wings of pigeons was definitely retarded by irradiations with X-rays at 1 to 15 days of age. There was no effect on the bones of birds irradiated 5 mo. or older. At 1 to 3 days of age the bones were most sensitive to irradiation, but they were less so at 4 to 6 days, and there was little relative response in birds irradiated at ages older than 5 mo., as the bones had attained full growth at that time. Doses of 750 r. produced no observable effect, but those of 1,000 r., 1,500 r., and 2,000 r. were increasingly effective in this order.

FIELD CROPS

Correcting potash deficiency in growing corn, J. B. WASHKO (*Tennessee Sta. Cir.* 93 (1945), pp. [4], *illus.* 5).—Corn grown on a K-poor Fullerton cherty silt loam showed definite K-deficiency symptoms. It responded to acre applications of 25, 50, and 1,000 lb. of potassium chloride, and that treated with 50 and 100 lb. 40 days after planting made greater yield increases. While applications 59 days after planting also corrected K deficiency, improvement was least when K was applied 79 days afterward. Corn of better quality was produced on plots receiving 50 and 100 lb. of potassium chloride.

The water factor in transplanting guayule, L. C. ERICKSON. (U. S. D. A.). (*Amer. Jour. Bot.*, 32 (1945), No. 10, pp. 634-643, *illus.* 10).—The main physiological benefit of topping guayule transplants came from reduction of transpiration, without which tap roots of leafy transplants with few or no lateral roots almost always became low in moisture content and failed to generate new roots within a reasonable period of time, as contrasted with the best results obtained for certain degrees of topping, under conditions of both water culture and soil. When relative humidity was high (95 to 100 percent) little or no defoliation was needed to obtain rooting of plants in water. In leafy transplants water evidently is often severely limiting in the formation of new roots.

The potato in health and disease, T. WHITEHEAD, T. P. MCINTOSH, and W. M. FINDLAY (*Edinburgh: Oliver & Boyd*, 1945, 2. ed., *rev. and enl.*, pp. 400+, *illus.* 32).—This general treatise considers the international position of the potato; its country of origin; intervarietal differences in the foliage, flowers, roots, tubers, sprouts, and stolons; variations and correlations; maintenance of pure stocks; cultivation; manuring; surplus potatoes on the farm; and the chief diseases of the crop. Appendixes take up fungicides, descriptive observations on some varieties in Britain, and descriptions of potato sprouts. There are 18.5 pages of references.

The effect of shearing sugar-beet seed on stand of beets, on labor requirements at the time of blocking and thinning, and on yield of roots, R. W. BELL, L. S. ROBERTSON, and R. L. COOK (*Michigan Sta. Quart. Bul.*, 28 (1945), No. 2, pp. 157-164, *illus.* 2).—A field study of sugar beets grown from sheared v. unsheared seed was conducted under weather and soil conditions unfavorable for seed germination and seedling growth. Compared with the amount of time required to block and thin beets grown from unsheared seed planted at the rate of 15.0 lb. per acre, the use of high-grade sheared seed at an average rate of 4.2 lb. per acre reduced the amount of time required to block and thin the beets 30.3 percent. The greatest saving of labor was effected where sheared seed was planted at the relatively low rate of 2.6

lb. per acre. However, the use of sheared seed at a high rate, 6.3 lb. per acre, also resulted in a marked saving. Post-thinning stand counts were lowest where sheared seed was planted at the rate of 2.6 lb. per acre; highest where unsheared seed was planted at the rate of 15.0 lb. per acre.

The study indicates that where the beet seedlings are unevenly distributed in the row a germination stand count of nearly 30 is necessary if a post-thinning stand of 90 beets per 100 ft. of row is to be attained. More nearly uniform distribution of sheared seed in the row would make possible lowered planting rates, lowered germination stands, and post-thinning stands of 100. Beets grown from sheared seed outyielded significantly those grown from unsheared seed, although the number of marketable beets on the sheared-seed plots at harvest time was less. Apparently with sheared seed the seedlings were disturbed less in the thinning process than with unsheared seed.

The relation of test weight and protein content to the milling and baking quality of hard red spring wheat hybrids, R. H. HARRIS and L. R. WATKINSON. (N. Dak. Expt. Sta.). (*Jour. Agr. Res. [U. S.]*, 72 (1946), No. 3, pp. 131-136).—Very significant differences between crop years were found in test weight, wheat protein content, flour yield, and flour loaf volume for 659 samples of hard red spring wheat produced in the Fargo nursery over a 4-yr. period. These differences were ascribed principally to yearly variation in weather conditions, variations in the genetic composition of the wheats being less important.

Correlation coefficients for each of the four crop years between test weight and flour yield were so low as to be of no practical significance, while the coefficients between wheat protein content and loaf volume, though generally higher, were of little practical value for predicting loaf volume from wheat protein content. The relationships between the different pairs of variables were essentially linear in character.

The results secured in these investigations are thought to show the danger of relying solely upon test weight and wheat protein content data to predict accurately milling and baking quality in nursery row samples of hard red spring wheat.

Herbicidal use of carbon disulfide, H. A. HANNESSON, R. N. RAYNOR, and A. S. CRAFTS (*California Sta. Bul.* 693 (1945), pp. 57, illus. 34).—Toxicity studies with CS_2 and experiments to determine effects of dosage, spacing, and depth of injection, under varying soil conditions such as high and low soil moisture, presence and absence of plow sole, and variations in profile character are reported, together with a historical review of research with CS_2 as a herbicide and directions for and discussion of its practical use.

CS_2 is a volatile liquid, and when injected into the soil forms a toxic gas which permeates the pore spaces and renders the soil atmosphere poisonous to plant roots. Different weed species respond differently to CS_2 , primarily because of their soil requirements and root distributions. The standard treatment evolved is injection of 2 fluid oz. of liquid in holes 18 in. apart each way to a depth of 6 to 8 in. Effectiveness of CS_2 is determined by many factors, mostly related to the soil. Rapid diffusion of the gas is favored by high soil temperature, low moisture content, and loose, open structure. Structure predominates under most field conditions. Since prevention of losses of the vapor from the surface is as essential as uniform distribution through the soil, the surface soil is sealed after an injection. Compaction by rolling and tamping is part of the standard procedure, and treatment followed by sprinkling or made after early fall rains is also common. Shallow injection is used where the surface soil is moist and can be effectively sealed, and deep injection where the topsoil is dry. Effective mulching is necessary in dry soil. Wide spacing of injection points is economical, but only under favorable conditions

of soil temperature can the distance exceed 18 in. Spacing may be as close as 12 in. where conditions are adverse.

Warm, coarse-textured, pervious soils that can be sealed effectively may require only 10 lb. per square rod, or 1,600 lb. per acre, i. e., half the standard amount. In moist, fine-textured soils and under adverse conditions, dosage may be increased to 25 or 30 lb. per square rod. Plow sole is the commonest soil structure interfering with CS₂ treatment, and if dense and wet may be almost completely impervious to the vapor. Where the plow sole cannot be broken up before application, soil moisture should be reduced by growing a vigorous annual crop, and injection should place the liquid on top of the dry sole beneath at least 10 in. of well-pulverized dust mulch. Hardpan, because of its position, does not interfere with weed control by CS₂.

Summer is the most favorable time to use CS₂ as to soil temperature and moisture. CS₂ should not be applied during heavy wind, but light wind does not interfere if the surface sealing is adequate.

Notes on some variations in field bindweed (*Convolvulus arvensis* L.), E. O. BROWN. (Iowa Expt. Sta. coop. U. S. D. A.). (*Iowa State Col. Jour. Sci.*, 20 (1946), No. 2, pp. 269-276, illus. 4).

HORTICULTURE

Rooting of cuttings from plants sprayed with growth-regulating substances, V. T. STOUTEMYER and F. L. O'ROURKE. (U. S. D. A.). (*Amer. Soc. Hort. Sci. Proc.*, 46 (1945), pp. 407-411).—Cuttings taken after a certain interval from plants sprayed with 2,4,5-trichlorophenoxyacetic acid or its sodium salt in a suitable concentration showed essentially the same rooting response as did cuttings treated with growth substances according to accepted methods. The most desirable time interval between spraying and taking the cuttings was not fully established. That the effect diminishes gradually with time was indicated in experiments with privet.

There is a need of adjusting the concentration of the spray to different species in order to obtain optimum results. Noticeable effects were noted on the foliage of the sprayed plants, with epinasty of the leaves and the terminal portions of the growing shoots being common. Some plants showed discoloration of the foliage. Whether or not these external effects would persist and cause abnormalities in the succeeding growing season is yet to be determined.

The field snapping method of harvesting asparagus, K. C. BARRONS (*Michigan Sta. Quart. Bul.*, 28 (1945), No. 2, pp. 111-114, illus. 1).—During the acute labor shortage caused by the war, a test was made of a simple method of harvesting asparagus spears by breaking them in the field rather than cutting below the soil, which is the usual practice. Labor costs were reduced by snapping and the yields of cannable asparagus were slightly larger than in cutting operations. In addition less labor was needed in the cannery.

The control of weeds in canning peas with chemical sprays, K. C. BARRONS and B. H. GRIGSBY (*Michigan Sta. Quart. Bul.*, 28 (1945), No. 2, pp. 145-156, illus. 4).—This article consists of a report of experiments on the use of selective sprays of the "dinitro" compounds for the control of annual weeds, some results of tests on the value of 2,4-D for the eradication of perennials, and a summary of recommendations for the use of the various herbicides. Temperature was an important factor in the success of various sprays for annual weeds. Best results were obtained when the air temperature remained above 70° F. for several hours after application. Practically no weed kill occurred when the temperature was below 60°. In general the best results were obtained when the vines were dry and no rainfall occurred for several hours after spraying. Pressures between 40 and 125 lb. gave the best results.

In the case of the 2,4-D spray, found very promising for controlling Canada thistle, it is suggested that the spray be used to clean the fields the year before they are planted to peas. The best success was obtained when the thistles were in an actively growing condition, no later than the full bloom stage. Spot treatments could be employed in pea fields for eradicating patches of thistle.

Growing tree fruits for home use, W. P. JUDKINS (*Ohio Sta. Bmo. Bul.* 238 (1946), pp. 3-18, illus. 9).—Information is presented on varieties of apple, cherry, peach, pear, and plum; pollination requirements; planting; culture; fertilization; training and pruning; fruit thinning; disease and insect control; harvesting; etc.

Blossom structure and setting of Delicious and other apple varieties, R. H. ROBERTS. (Wis. Expt. Sta.). (*Amer. Soc. Hort. Sci. Proc.*, 46 (1945), pp. 87-90, illus. 3).—In pollination experiments in 1943 the varieties Dudley, Jonathan, McIntosh, Fameuse, Wealthy, and Wolf River, were found self-unfruitful but interfertile. Red Rome was self-fruitful. Duchess (Oldenburg), Cortland, Jonathan, McIntosh, McMahon, Northwestern Greening, and Red Rome gave good sets of fruit when applied to Delicious flowers.

Studies of the flower structure of Delicious showed the pistils to be so short that honeybees in the act of collecting nectar do not always touch the stigmas. In only about 20 percent of the visits did the bees crawl over the anthers and stigmas. Bumblebees on the other hand crawl over the tops of the flowers and effect satisfactory pollination of Delicious. Delicious orchards with a good bumblebee population set satisfactorily.

Observations on the honeybee pollination relationship in several varieties showed that varieties with flower structure like Delicious are also poor fruit setters.

Distance from a pollen source was shown to be an important factor in successful pollination of Delicious flowers by honeybees. Favorable pollination of the Delicious resulted from a good population of bumblebees, a very nearby pollen source, or a very high honeybee population.

Effect of naphthaleneacetic acid spray on maturity of apples, L. P. BATJER and H. H. MOON. (U. S. D. A.). (*Amer. Soc. Hort. Sci. Proc.*, 46 (1945), pp. 113-117).—A number of apple varieties, representing a seasonal distribution in maturity from midsummer to late autumn, were treated before harvest with naphthaleneacetic acid to determine if the growth substance had any stimulatory effect on maturity. There was observed a direct stimulatory effect of the acid on summer varieties such as Close, Williams, and Duchess (Oldenburg). In the case of Summer Rambo there was no positive evidence of stimulation although there was a slight suggestion that apples from the check trees were somewhat firmer at harvest. Jonathan and Rome Beauty apples showed no effects. The naphthaleneacetic acid appeared to have a slight stimulatory effect on the maturity of Delicious. The stimulatory effect of naphthaleneacetic acid on the summer varieties may have been due to the softer flesh and limited storage life of these varieties, and the relatively high temperatures prevailing generally when the fruits attain picking maturity may also have been a contributory factor.

Retardation of pre-harvest drop of apples through aerosol application of growth-regulating substances, H. B. TUKEY and C. L. HAMNER. (N. Y. State Expt. Sta.). (*Amer. Soc. Hort. Sci. Proc.*, 46 (1945), pp. 102-108, illus. 2).—Working with dwarf and semidwarf trees of the McIntosh, Macoun, and Kendall varieties, all of which tend to drop their fruit prematurely, comparisons were made of the effect of naphthaleneacetic acid applied in aerosol form and in water sprays.

Timing was found very important, as shown in a poor response by McIntosh trees treated 7 days before commercial harvest. Applications made at 4 weekly intervals beginning 1 day before the date of commercial harvest proved highly effective. At the relatively high concentration of 40 mg. of growth-regulating substance per

bushel of fruit, 1 lb. of aerosol containing 0.25 percent of the growth substance was equivalent to 28.25 gal. of water spray containing 10 p. p. m. of the same material.

Treatments were particularly effective on the Kendall apple. At a time when only 2 percent of the fruit of untreated trees remained on the trees, there was 87 percent on the treated. By this time many of the remaining Kendall fruits were cracked and split and long past their optimum picking condition. In a single test of 2,4-dichlorophenoxyacetic acid on a Kendall tree, there was a strong retention of the fruits.

The aerosol method appears very promising for relatively small trees, and may be a good method for applying other types of materials commonly used in spraying fruit trees.

Relative effectiveness of sprays, dusts, and aerosols of naphthalene-acetic acid on harvest drop of apples, P. C. MARTH, L. P. BATJER, and H. H. MOON. (U. S. D. A.). (*Amer. Soc. Hort. Sci. Proc.*, 46 (1945), pp. 109-112, illus. 1).—Operating with 13-year-old Stayman Winesap trees in the Kearneysville, W. Va., experimental orchard, comparisons were made of aerosol, dusting, and spraying methods of applying naphthaleneacetic acid to reduce the preharvest fall of fruit. All treatments were significantly effective, the dusts as a whole being somewhat more potent than the sprays. The dusts were applied in early morning to take advantage of the dews. The high degree of effectiveness obtained with naphthaleneacetic acid in aerosol form was of particular interest. In the application there was no visible indication that all the fruits were being contacted with the fog, yet the results were comparable to those obtained with the other methods. Light rains occurring soon after applications may have had some influence on results.

Use of growth-promoting substances in the prevention of apple drop following frost, T. SWARBRICK (*Nature [London]*, 156 (1945), No. 3971, pp. 691-692).—In a preliminary trial, two apple varieties—following a severe spring frost—were sprayed with a wash containing β -indolebutyric, α -naphthaleneacetic, 2,4-dichlorophenoxyacetic, and β -naphoxyacetic acids, making a total hormone concentration of 75 p. p. m. The extraordinary effect in keeping the fruit on the trees was shown by the fact that unthinned trees averaged 9,486 fruits per tree.

Differences in after-ripening requirements of several sources and varieties of peach seed, R. F. CARLSON and H. B. TUKEY. (N. Y. State Expt. Sta.). (*Amer. Soc. Hort. Sci. Proc.*, 46 (1945), pp. 199-202).—Peach pits collected from nine varieties in the station orchard and Lovell pits obtained from California were opened to obtain the seeds, which were then after-ripened in moist peat moss at 34° to 37° F. Five to 10 seeds were removed at weekly intervals from each lot and germinated in petri dishes held at 60° to 75°. Of the 10 lots, 7 germinated to some degree after 3 weeks of after-ripening. The maximum percentage of germination was reached earlier by some varieties than others. One variety, Muir, showed no germination until after 11 weeks of after-ripening. Check observations on four lots of Lovell seed planted in a field on September 26 and sampled on December 5 showed results comparable to those obtained with Lovell seeds after-ripened in the laboratory. Each variety and source of seed had specific after-ripening requirements, with most lots showing a steady increase in percentage germination and in development of strong seedlings up to about the tenth week of after-ripening treatment.

The effect of cultivation, sod, and sod plus straw mulch on the growth and yield of peach trees, W. P. JUDKINS and I. W. WANDER. (Ohio Expt. Sta.). (*Amer. Soc. Hort. Sci. Proc.*, 46 (1945), pp. 183-186, illus. 1).—Six soil treatments were compared in a South Haven peach orchard planted in 1935 on Wooster silt loam soil. One treatment cultivation-soybean-rye, had to be discarded because of

location in a poorly drained area. During the first 10 yr. none of the remaining five systems, (1) sod; (2) sod plus straw mulch; (3) cultivation plus cover crops; (4) cultivation, cover crops, and stover; and (5) cultivation, cover crops, and manure, had any significant effect on blooming date, ripening date, quality or color of fruit, or winter injury to wood or buds. Measurement of leaves in 1941, 1943, and 1944 showed no definite correlation between the different soil treatments and leaf area. Yields were found to be proportional to the size of trees. The average trunk circumference of trees in the sod plots was smaller than in the other plots. Growth and yield were not proportional to total soil organic matter, undecomposed organic matter, or soil moisture. The principal factor limiting tree growth in the sod plots appeared to be the lack of available nitrogen.

Fruitfulness in peaches and its relationship to morphology and physiology of pollen grains, L. R. DETJEN (*Delaware Sta. Bul.* 257 (1945), pp. 24, illus. 5).—Of 37 varieties of peach examined over a period of 4 yr., all were self-fruitleful except 4, Candoka, Chinese Cling, J. H. Hale, and June Elberta. Hand pollination resulted in larger sets of fruit than were obtained by simple bagging of the branches, but the latter method gave an adequate set and is more preferable because of less labor required. Differences in set of cross-pollinated flowers were observed among trees of the same and different varieties, among branches on a single tree, and among different varieties of pollen applied on a single tree.

Chinese Cling in 1941 produced an abundance of normal viable pollen grains which however proved incompatible with related pistils. Non-emasculated flowers of pollen-sterile varieties yielded usually a heavy set of fruit upon cross pollination. Elberta, Golden Jubilee, Halchaven, and Rio-Oso-Gem proved effective pollinizers for Candoka and June Elberta. Pollen-sterile varieties produced a small percentage of viable pollen which induced a small set of fruit on bagged branches.

A study of the pollen of peach varieties showed differences in gross morphology and physiology. Certain varieties, like Cumberland, Early Elberta, Golden Globe, and Kalhaven, produced mostly large, oval pollen grains. Fireglow and Rio-Oso-Gem produced mostly large irregular but viable pollen grains. The majority of the varieties under study produced a mixture of large oval, large irregular, and small irregular grains in various proportions. Rio-Oso-Gem was the only peach to produce exclusively large, irregular pollen grains. Fireglow produced about 62 percent of these grains. In all the varieties, except Rio-Oso-Gem and Fireglow, the relative number of large oval grains present in the pollen was a good index to viability. Variability in size of pollen grains might be used as a means of identification of varieties.

Some effects of irrigation on the interrelations of growth, yields, and drying ratios of French prunes, A. H. HENDRICKSON and F. J. VEIHMAYER. (Univ. Calif.). (*Amer. Soc. Hort. Sci. Proc.*, 46 (1945), pp. 187-190).—Although at the beginning of the experiment in 1932 the average cross-section areas of the trunks of trees that were to receive no irrigation water during the growing season were slightly larger than those of the trees that were to be irrigated, at the end of 12 yr. the irrigated trees were larger in trunk cross section and in size of top. The irrigated trees produced usually more fruit per unit of cross-section area than did the unirrigated. The lack of readily available moisture in the soil after July 1 had an apparently harmful effect on fruit setting. Inasmuch as the unirrigated trees had rather consistently a lower drying ratio and a small ratio of yields to cross-section area, it may be argued that correlations between drying ratios of prunes and the ratio of yields or numbers to cross-section areas of trunks would necessarily follow when the two groups were used in the same calculation. If the trunk cross-section area may be used as a measure of leaf area, the fruits on the unirrigated trees had a larger leaf area per prune than did the irrigated trees. If this is true,

the increased leaf area may help explain the slightly lower drying ratio found frequently with prunes from the unirrigated plots.

Ripening of the Italian prune as related to maturity and storage, F. GERHARDT and H. ENGLISH. (U. S. D. A.). (*Amer. Soc. Hort. Sci. Proc.*, 46 (1945), pp. 205-209, illus. 1).—The variation in maturity of Italian prunes from different orchards and grown under different cultural conditions was great enough to preclude the use of firmness, total acids, or soluble solids as reliable indexes of harvesting maturity. Color of flesh together with the solids-acid ratio was the most satisfactory guide to proper time to harvest. Fruits with flesh of a medium to dark amber color and a solids-acid ratio of 13 to 15 were judged to be acceptable for long distance shipment.

Immediate storage of prunes at 31° F. was followed by a low temperature injury characterized by mealiness of the fruit and discoloration and breakdown of the flesh, usually evident at about the time the fruit had attained its best dessert quality. Partial ripening before storing at 31° or holding fruit at 40° to 45° prevented this storage breakdown.

The Lamida, Ebony, and Spalding sweet cherries, L. VERNER (*Idaho Sta. Cir.* 109 (1946), pp. 4, illus. 1).—Descriptive information is presented on three new cherries developed by the station from open-pollinated seed. The ovule parent is thus known and the pollen parent unknown, although presumed to be nearby trees of compatible varieties. The Lamida is said to resemble closely the Lambert cherry and to be far superior to Lambert in resistance to fruit cracking. All three of the new varieties are described as very good or better in quality. Spalding, because of its exceptionally firm flesh, appears promising for long shipment.

The effect of varying the reaction of organic soil on the growth and production of the domesticated blueberry, P. M. HARMER (*Soil Sci. Soc. Amer. Proc.*, 9 (1944), pp. 133-141, illus. 6).—Variation of the soil reaction was accomplished in three different ways: (1) By the use of mixtures of alkaline and very acid soil without the introduction of any foreign material, (2) by addition of sulfur at different rates to alkaline soil in greenhouse and to slightly acid soil in field, and (3) by addition of ground limestone at different rates to soil so intensely acid that lime might be a limiting factor on growth and production. Results showed satisfactory pH between 4.0 and 5.2, with optimum from 4.5 to 4.8. Sulfur proved very satisfactory in correcting pH which was too high for satisfactory growth, but from a practical standpoint its use is not advisable with soil pH above 6.5. With soil pH below 4.0, a light application of ground limestone is likely to be beneficial. Reaction of soil just below the plowed layer should be considered in applying sulfur or limestone. Explanation for the unsatisfactory growth of blueberries in soil with high pH may lie in the soil content of available calcium, magnesium, and possibly nitrate and in the effect of the first two on availability of the soil's manganese and possibly boron.

The cultivated blueberry industry in New Jersey, 1944, D. T. PITT (*N. J. Dept. Agr. Cir.* 356 (1945), pp. 7-42, illus. 7).—The results of a survey made in cooperation with the New Jersey Experiment Stations. For notes on insect pests, see p. 84.

Surface and volume determinations of citrus fruits, F. M. TURREL, J. P. CARLSON, and L. J. KLOTZ. (Calif. Citrus Expt. Sta.). (*Amer. Soc. Hort. Sci. Proc.*, 46 (1945), pp. 159-165, illus. 3).—Surface and volume tables for oblate and prolate spheroids and spheres were found of value in estimating surfaces and volumes of citrus fruits such as Marsh grapefruit, Washington Navel orange, Valencia orange, and Eureka lemon. The average percentages of difference between actual measurements of the fruits and the values determined by surface and volume tables ranged from 2.23 to 5.59 percent for surface area and 1.95 to 8.35 percent for volume.

Changes in lemons during storage as affected by air circulation and ventilation, E. M. HARVEY (*U. S. Dept. Agr., Tech. Bul. 908 (1946), pp. 32, illus. 9*).—This study showed in general (1) that air circulation cannot be substituted for ventilation as ordinarily provided in commercial storage, (2) that sufficient carbon dioxide does not accumulate in commercial storage to injure lemons, but it did not eliminate the probability that certain other emanations (particularly ethylene) of molds and of the lemons themselves can easily become injurious to lemons held in long storage; and (3) that the percentage of buttons that are green and their rate of change from one color class to another affords a practical means of predicting the maximum safe period for holding a given lot of lemons in storage.

Weekly loss of weight was greater in a commercial storage room than in either a still-air chamber or a chamber which had air circulation. Lemons of different stages of maturity lost weight in the following order: Tree-ripe, silver, light-green, and dark-green. For all practical purposes differences in rate of loss of weight were negligible because of differences in the relative length of the storage period for fruit of different maturities. The first external sign of *Alternaria* decay in a lot was seldom found to indicate decay in more than 1 percent of the other lemons of the lot. When at least 2 percent of the lemons showed externally visible symptoms of decay the lot was considered to have reached decay break (beginning of definite susceptibility to *Alternaria*). This stage was later fixed arbitrarily at 3 percent. The length of time lemons could be held in storage before decay break occurred depended upon their stage of maturity at storage, the time of picking, the year, and the storage conditions; the rate of subsequent decay was rapid and rather uniform regardless of the original storage quality. At or near decay break lemons changed from almost complete immunity to *Alternaria* to extreme susceptibility. Lemons picked in midwinter had the best storage quality; after February their keeping quality diminished until late spring and early summer. Light-green lemons picked in February did not reach their decay break until 6 weeks after those picked from the same grove in May. Lemons keep much longer in storage in some years than in others.

The organic acids of lemon fruits, W. B. SINCLAIR and D. M. ENY. (Calif. Citrus Expt. Sta.). (*Bot. Gaz.*, 107 (1945), No. 2, pp. 231-242, illus. 3).—The acidity of lemon juice is due chiefly to citric and malic acids; others, if present, are in very small amounts. The citric acid determined on the pure juice did not differ significantly from the amount precipitated by lead acetate; the total acid content thus precipitated from lemon juice was equal—within experimental error—to the sum of the citric and malic acids. The difference between the free-acid fraction and the total organic-acid radical (citric and malic) was relatively much greater than the combined acids determined from the alkalinity of the ash. Since this difference was not reflected in the titratable acidity or pH values, it is believed to represent the quantity of organic acid in the ester form. The alkalinity of the ash represented the organic acid combined in salt form with the excess inorganic cations. The titration curve of lemon juice was very similar to that of a pure citric acid solution provided a correction was made for the combined acid naturally occurring in the juice. A definite relation existed between the pH and the amount of acid in the salt or combined form. The small fluctuations in pH of mature lemon juice were correlated with the large ratio of free acid: combined acid. The free acids (mg. per cc.) increased and the pH of the juice decreased as the fruit grew larger. The great reduction in pH (5.2 to 2.6) occurring in fruits 2 to 4 cm. in diameter was due to a correspondingly large increase in free acid. Further increase in fruit size (up to 6 cm. diameter) resulted in a slight decrease of about 0.3 pH, while the free acids continued to increase gradually in the juice.

Plantas medicinales de posible cultivo en Puerto Rico [Medicinal plants for possible cultivation in Puerto Rico], E. NÚÑEZ MELÉNDEZ (*Puerto Rico Univ. Sta. Bul.* 67 (1945), *Span. ed.*, pp. 47+, *illus.* 6).—Prior to the war, the majority of the vegetable drugs were obtained from the Old World. During the war, a large variety of plants were tested in the botanical garden of the University of Puerto Rico as to their possible culture. In this bulletin about 40 are described with notes as to the extraction and use of the essential ingredient.

Cinchona investigations in Puerto Rico, R. E. HARPER and H. F. WINTERS. (P. R. Fed. Expt. Sta.). (*U. S. Dept. Agr., Agr. in Americas*, 6 (1946), No. 2, pp. 30–32, 37, *illus.* 3).—This is an account of experiments in progress to determine environmental and cultural factors essential to the growth and development of strains of cinchona which may be used to provide supplies of planting stock for various locations in the Western Hemisphere. A stem canker and two root diseases, responsible for large losses in the nursery and field, are closely associated with adverse soil conditions such as poor drainage and inadequate aeration. Thrips of various kinds are the worst insect enemies. There is a need of selecting strains of cinchona that are adapted to American conditions.

Cinchona officinalis in the Colombian Andes, A. L. McCOMB. (Iowa State Col.). (*Jour. Forestry*, 44 (1946), No. 2, pp. 92–97, *illus.* 3).—This paper presents a description of *C. officinalis*, its site requirements, its yield of bark, and the alkaloid content of bark in the eastern cordillera of the Colombian Andes. The species grows in dense, temperate or cool temperate, wet forests as a subdominant in high forest stands, or frequently as a dominant on high ridges. With tree diameters of 3 to 6 in., some 150 to 600 trees are required to yield a ton of dry bark, and it was necessary usually to cover some 375 acres to obtain this amount. Great variation was found in the alkaloid content of the bark.

FORESTRY

Effects of plant-growth regulators on shoot development and field survival of forest-tree seedlings, C. E. OSTROM. (U. S. D. A.). (*Bot. Gaz.*, 107 (1945), No. 2, pp. 139–183, *illus.* 12).—A series of seven experiments (October 1942–October 1943)—involving about 25,000 trees and several hundred feet of nursery bed—was carried out on seedlings of red, loblolly, shortleaf, pitch, and table-mountain pines, red spruce, tuliptree, and white ash treated in the nursery bed before storage or planting with naphthaleneacetic acid, naphthalenemethylacetate, naphthaleneacetamide, and mixtures of naphthalene compounds with or without indolebutyric acid applied in various ways. The normal surge of leader growth of pine seedlings was not delayed or substantially lessened by 200 or 600 mg./l. sprayed on expanding buds or old foliage. Once started, needle development could be completely arrested shortly after treatment and “frozen” for the remainder of the season on red and table-mountain pines; undesirable curving of the new leaders resulted, however, on the latter. At the end of the growing season, red pine seedlings sprayed in May with 600 mg./l. naphthaleneacetamide had somewhat lower top : root ratios and much lower average dry weights than the untreated. Inhibiting treatments were close to the lethal concentration. Red pine seedlings with only one-third to one-half the normal quantity of new foliage from inhibition by growth regulators were no more resistant to artificial drought than the untreated. Top pruning of loblolly pine during early spring resulted in decreased resistance to artificial drought and to transplanting during the same summer.

Vapors and sprays of naphthalenemethylacetate and a mixture of growth regulators effectively prevented or restricted the development of etiolated shoots of white ash seedlings held in unrefrigerated storage until June; initiation of new roots was

also stimulated, particularly on the stem. Inhibition of shoots and stimulation of roots were much less distinct in treated trees heeled-in outdoors. Prestorage treatments with growth regulators failed to affect the survival of white ash seedlings planted in May when controls were still largely dormant, but resulted in higher initial survival and greater root growth of trees planted in June; naphthalene-methylacetate applied as vapor (0.3 or 0.5 mg./cu. ft. of space for 18 hr. at 70° F.) or spray (100 mg./l. in dilute commercial wax emulsion) was successful for 2-yr. seedlings. Similar prestorage treatments failed to improve survival of loblolly or shortleaf pine seedlings. Preplanting treatments were given to tops of seedlings of red, shortleaf, and loblolly pines and to roots, tops, and whole plants of red spruce and tuliptree. Various treatments with 80-1,000 mg./l. naphthaleneacetic acid and other compounds failed to improve the field survival of conifers and usually lowered it. Seedlings of tuliptree dipped in emulsions of 200 or 400 mg./l. of mixture of growth regulators just before spring planting leafed out more slowly than controls; survival was, however, so uniformly high for all treatment groups (May planting) that no advantage resulted from the prolonged dormancy. Treated tuliptree seedlings showed a slight stimulation of root growth in the heeling-in bed and excelled controls in the total dry weight by the end of the first season in the plantation. Application of emulsions of lanolin or commercial wax to conifer foliage immediately before planting resulted in higher survival during the spring months; after a long severe drought (1943), their survival exceeded that in controls in some but not all plantations. There are 17 references.

Effects of soaking with indolebutyric acid on root development and survival of tree seedlings, T. E. MAKI and H. MARSHALL. (U. S. D. A. et al.). (*Bot. Gaz.*, 107 (1945), No. 2, pp. 268-276, illus. 3).—Eastern red oak and loblolly pine seedlings were treated just before planting by soaking the roots for 24 hr. (also a 6-hr. series for pine) in aqueous solutions of indolebutyric acid at 2.5 to 160 mg. per liter; root volumes were measured before planting and again when the seedlings were lifted at the end of the first growing season. Consistent increases in root volume of red oak followed soaking in all concentrations; they were statistically significant at 40 mg./l. or more. A barely significant increase in survival followed treatment of red oak with 5 mg./l.; on the other hand, a marked increase in mortality followed treatment with 80 mg./l. or more. The largest increases in root volume of red oak were associated with the greatest mortality. Treatments usually increased the root volume of loblolly pine, though there was no consistent relationship between root volume and concentration. A marked increase in mortality of the pine followed treatment with concentrations above 20 mg./l.

Analysis of fire spread in light forest fuels, W. L. FONS. (U. S. D. A. coop. Univ. Calif.). (*Jour. Agr. Res. [U. S.]*, 72 (1946), No. 3, pp. 93-121, illus. 12).—The analysis of rate of fire spread in light forest fuels reported in this paper is based on the theory that the spread of a fire can be expressed as successive ignitions of adjacent fuel particles, and that its rate is therefore governed by the time required to raise successive fuel particles to ignition temperature. Equations have been derived for rate of fire spread in homogeneous and heterogeneous fuel beds, taking into account the physical characteristics of the fuel particles, the arrangement of the bed, and the pertinent attributes of the atmosphere. The spread equations are expressed in terms of the following fundamental variables: (1) Film conductance, (2) heat transfer factor for radiation, (3) ignition temperature, (4) fuel particle spacing, (5) surface volume ratio of fuel, (6) specific heat, (7) density of fuel, and (8) fuel temperature. It has been shown that the variables ordinarily recognized in the field practice—wind velocity, fuel moisture, fuel density, fuel size, fuel bed compactness, slope, and time—influence fire spread only as they produce changes in the fundamental variables.

The results of field and laboratory experiments were used to check the theory and analysis, as well as to provide quantitative information for determining the magnitude of the effects of variables measurable in field practice on the rate of spread.

Prescribed burning in relation to grazing in longleaf-slash pine type, P. C. LEMON. (U. S. D. A. coop. Ga. Coastal Plain Expt. Sta.). (*Jour. Forestry*, 44 (1946), No. 2, pp. 115-117).—Studies conducted on the Alapaha Experimental Range in Georgia showed that planned moderate burning in the longleaf-slash pine type improves the forage for grazing and results in better cattle gains. Such burning may be also beneficial with respect to fire hazard reduction, seedbed preparation, and brown spot control.

Planned burning to improve grazing can be done successfully without excessive tree damage, if the area selected for burning has an adequate stand of trees capable of withstanding light fires, if the area is divided into small units by natural or prepared firebreaks, if conditions for burning are considered carefully, and if the job is done by personnel trained in the skillful handling of fires.

Christmas tree production, J. C. MOORE. (Coop. U. S. D. A.). (*Alabama Sta. Cir.* 92 (1945), pp. 15, illus. 7).—In 1940 a total of 15 species of evergreens were planted in a test of their potential value as Christmas tree material. Four types of culture were compared, (1) native vegetation, (2) partridge peas, (3) lespedeza sericea, and (4) a combination of crimson clover and rescue grass. Trees were planted in contour rows 4 ft. wide and spaced 4 ft. in the rows, thus providing approximately 2,700 trees per acre. All four systems of culture were effective in controlling erosion, but because the cover crops in three of the systems made their growth in summer there was serious competition between the covers and the trees for water. The crimson clover-rescue grass combination made its growth during winter and early spring and furthermore the mature vegetation fell to the ground and formed a heavy mulch which eliminated most of the weed growth during the summer.

Of the 15 species Arizona cypress, red cedar, scrub pine, and white pine, in the order given, were most promising for Christmas tree production. Arizona cypress grew rapidly, had good form, and held its needles and rich aroma for a long period after cutting, and while it had one minor disqualification, that of a disease which attacked the tender growing points giving them a brownish color, it proved to be the most desirable from the consumer's standpoint, commanding a ready sale at good prices. There was also evidence that desirable new trees would grow from its cut stump, indicating that several trees might be harvested ultimately from the original plant.

Studies of Chinese gallnuts, P. C. YEH and C. S. CHENG (*Jour. Forestry*, 44 (1946), No. 2, pp. 121-124).—This paper discusses the kinds, distribution, formation, development, constituents, and yield of gallnuts, a forest byproduct of importance in southwestern China. The trees that produce gallnuts all belong to the cashew family, Anacardiaceae, and include species of *Rhus* and *Pistacia*. The insects causing the galls are aphids.

DISEASES OF PLANTS

The Plant Disease Reporter [February 15 and March 15, 1946] (*U. S. Dept. Agr., Plant Disease Rptr.*, 30 (1946), Nos. 2, pp. 35-64, illus. 2; 3, pp. 65-92).—The above issues contain the following:

No. 2.—Host-parasite check list revision—*Medicago-Petalostemon* (Leguminosae), by F. Weiss; legume diseases previously unreported from Oklahoma, by D. A. Preston (Okla. A. and M. Col.); seasonal variations in the incidence of the loose

smuts of wheat and barley in West Virginia, by C. F. Taylor and J. G. Leach (W. Va. Univ.); notes on diseases of garden crops in Georgia in 1945, by J. H. Miller (Univ. Ga.); late blight on tomatoes on the west coast of Florida, by A. L. Harrison; diseases of vegetable crops during December in Palm Beach County, Fla., by G. R. Townsend, R. C. Cassell, E. L. Felix, and R. Desrosiers (Fla. Everglades Expt. Sta.); a nomenclatorial discussion of *Ustilago striiformis*, by J. A. Stevenson; notes on visual differentiation of white pine blister rust from pinyon rust in the telial stage, by J. W. Kimmey; plant diseases recorded from new locations in Arkansas by V. H. Young (Univ. Ark.) and in Louisiana and Oklahoma by D. A. Preston (Okla. A. and M. Col.); and brief notes on cornstalk rots in Virginia in 1945 by S. B. Fenne (Va. A. and M. Col.) and virus disease on avocado—a correction by R. C. Baines.

No. 3.—Host-parasite check list revision—*Phaseolus* (Leguminosae), by F. Weiss, and note regarding distribution of separates of revised check list; some psychological aspects involved in conducting plant disease surveys—personal bias a factor to be reckoned with in estimating and evaluating plant disease losses, by P. R. Miller; observations on blasting of onion seed heads in Idaho, by E. C. Blodgett (Idaho Sta.); observations on Mississippi tomato diseases during 1945, by L. P. McColloch, H. H. Foster, and J. M. Lutz (coop. Miss. Sta.); nut diseases in Oregon in 1945, by P. W. Miller; a note on the distribution of black rot of orchids, by D. P. Limber; and diseases of vegetable crops during January in Palm Beach and Broward Counties, Fla., by G. R. Townsend, R. C. Cassell, E. L. Felix, and R. Desrosiers (Fla. Everglades Sta.).

Preventing plant disease introduction, W. A. McCUBBIN. (U. S. D. A.). (*Bot. Rev.*, 12 (1946), No. 2, pp. 101–139).—In this analytic review (89 references) the author summarizes the problem of plant disease introduction from the restricted viewpoint of the United States, “in the hope of bringing out certain values and relations most likely to be useful in national thinking and planning.” The points brought out are the reality of disease introduction and the fact that it involves effective establishment, the past and present cost of foreign diseases to the country and the potential danger from further entries, special relations of contiguous lands, natural channels of introduction including human agencies, relation of pathogen groups to entry channels and of biological races to disease introduction, natural barriers to entry, factors influencing national efforts to prevent disease introduction, programs and procedures of disease exclusion, value of the foreign certificate, and viewpoints—pessimistic and optimistic—with respect to disease-exclusion possibilities.

Determination of factors injurious to plants in acid soils, T. WALLACE, E. J. HEWITT, and D. J. D. NICHOLAS (*Nature [London]*, 156 (1945), No. 3974, pp. 778–779, *illus.* 2).—A preliminary report on experiments emphasizing the importance of the visual method in diagnosing causes of crop failures due to defective nutrition, and of the sand-culture technic in analyzing complex soil problems of plant nutrition.

Chlorosis of plants in Idaho, E. C. BLODGETT (*Idaho Sta. Cir.* 110 (1946), pp. 7).—In southern Idaho and other arid regions of the western United States, chlorosis usually refers to the lime-induced type; this disease has been known to the station since 1894, but has increased noticeably in the recent past and is now regarded as the most important single disease affecting orchard and small fruit production in certain irrigated sections of the State. This circular briefly summarizes the information developed by the station, including suggested control measures.

Infection by viruses, M. A. LAUFFER and W. C. PRICE (*Arch. Biochem.*, 8 (1945), No. 3, pp. 449–468, *illus.* 6).—The development of an equation involving the Poisson series—applicable to the study of virus infectivity at various concentrations—is reviewed (20 references) and discussed. The fundamental assumption underlying this development is that virus infection depends on the chance occurrence of the

required a minimum number of virus units in the dose actually coming into contact with a susceptible region of the host. When the inoculation method is such that many foci of infection must be judged by gross symptoms, the results might deviate from the equations because of possible variability in the number of foci per entity showing gross symptoms. The development of an alternative hypothesis is also reviewed; according to it the distribution of the number of positive responses to varying dose levels is due solely to the variability of host susceptibility. It is shown that under special circumstances this theory could lead to a final result resembling fairly closely that obtained for the other theory. All the large amount of data examined from the literature tended to be consistent with the theory that the quantitative response at various dosage levels is due primarily to the chance occurrence of at least one infectious unit per dose; excluded entirely was the possibility that the response at various levels is due to the chance occurrence of a minimum of two or more units. These data also appeared to fit the alternative hypothesis when suitable restrictions were applied; independent evidence is presented, however, to show that this theory is untenable. The findings led to the conclusion that the only tenable theory at present available for explaining the character of the quantitative response of hosts to various doses of viruses is that the probability of infection is related to the probability of finding the minimum requisite number of infectious units in an element of volume which comes into intimate contact with a susceptible focus in the host. If this theory is correct, the data prove conclusively that for the viruses thus far studied, one infectious unit is sufficient to cause an infection. On the basis of present knowledge, therefore, the proposition that one infectious unit can cause virus infection is the most reasonable starting point for speculation concerning the nature of virus reproduction.

Determination of the isoelectric point of virus proteins by the staining technique, L. M. TARASSEVICH (*Compt. Rend. (Dok.) Acad. Sci. U. R. S. S., n. ser., 47 (1945), No. 9, pp. 666-668, illus. 1*).—It has been reported by many authors that the staining of live and dead tissues depends on the pH of the staining solution, the basis of this dependence being the difference between the electric charge of the staining solution and the substance which adsorbs the stain. The elaboration of a technic based on this dependence would enable determination of the isoelectric point of the virus proteins accumulating in plant tissues in crystalline form, purified preparations of which have not yet been obtained. The author tested this technic with three plant viruses and with the polyhedra of silkworm jaundice and found a close coincidence in results with those obtained by other methods. The proposed technic is distinguished by its simplicity and speed; the chief disadvantage lies in its relatively low precision, due to individual difference in evaluating the intensity of the staining reaction.

On the growth hormones in a diseased plant, K. SUKHORUKOV and B. STROGONOV (*Compt. Rend. (Dok.) Acad. Sci. U. R. S. S., n. ser., 47 (1945), No. 8, pp. 593-596*).—The authors review the work of others (11 references) and present the results of their own studies on growth hormones in diseased plants and in the secretions of parasites and saprophytes (oats with crown rust, potato with late blight, crown gall bacteria, and *Aspergillus niger*) and on the post-mortem formation of auxins. They conclude, in general, that the auxins of diseased plants are destroyed in protective necroses and that no auxins are formed in dead cells. Parasitic organisms which disturb correlations among the growth processes (e. g., crown gall bacteria) are found capable of producing and secreting the "auxins and hormones of cell division."

Some comparisons of bacterial plant galls and of their causal agents, A. J. RIKER, F. SPOERL, and A. E. GUTSCHE. (*Wis. Expt. Sta. (Bot. Rev., 12 (1946), No. 2, pp. 57-82*).—In this comprehensive review (101 references), comparisons are

made of nine bacterial plant gall diseases—beet pocket rot, cane gall, crown gall, Douglas fir gall, gypsophila gall, hairy root, oleander knot, olive knot, and pea fasciation, as well as some similar nonparasitic galls. The text considers the different kinds of bacterial galls, comparison of bacteriological characters, comparative life histories in relation to pathogenesis, locations of bacteria within the host plants and their movements within the tissues, and nonparasitic growths caused, e. g., by wounds, grafts, accumulated food materials, genetic characteristics, and certain chemicals including "plant hormones."

Physiologic specialization of the parasitic fungi, II, G. M. REED (*Bot. Rev.*, 12 (1946), No. 3, pp. 141-164).—As shown in this supplementary review (*E. S. R.*, 74, p. 48), the investigations of the past 10 yr. have resulted in the differentiation of many new races among a wide range of host plants. The author discusses and/or tabulates (with authority, year, and country) the number of races in cereal and other rusts, cereal and other smuts, powdery mildews, and other pathogens recorded during this period; there are 177 references.

Danish species of *Alternaria* and *Stemphylium*: Taxonomy, parasitism, economic significance, P. NEERGAARD (*København (Copenhagen): Einar Munksgaard, 1945, pp. 560, illus. 159; Dan. abs., pp. 417-430; Esperanto abs., pp. 431-437*).—The general part of this monograph on these two phytopathological fungus genera takes up material and methods, nomenclature, terminology, and taxonomy in the aspects applying to the study as a whole; the special part deals with the individual species; and a concluding section includes remarks on the life cycles, pathogenesis, and control of the fungi studied. Included also are 67 tables, 33.5 pages of references, and indexes to fungi and host plants.

Inhibition of the development of *Fusarium oxysporum cubense* by a growth substance produced by Meredith's actinomycetes, A. C. THAYSEN and K. R. BUTLIN (*Nature [London]*, 156 (1945), No. 3974, pp. 781-782).—In the tests reported, Meredith's organism (*E. S. R.*, 91, p. 163)—after 5 weeks' growth in food yeast waste liquor—had developed a sufficient concentration of inhibitory substance so that 1 cc. of the liquor prevented growth of *F. oxysporum cubense*. Though the active substance has not yet been isolated, it was found to be thermolabile and not to pass through a porcelain filter.

Observations on chytridiaceous parasites of phanerogams.—I, *Physoderma menyanthidis* de Bary, F. K. SPARROW (*Amer. Jour. Bot.*, 33 (1946), No. 2, pp. 112-118, illus. 41).—The author describes certain phases in the life history of this chytrid parasite of a bog-inhabiting flowering plant—*Menyanthes trifoliata*. The fungus, *P. menyanthidis*, overwinters in the resting spore stage; at germination, it cracks open and a thin-walled fingerlike structure is produced within which zoospores are formed. These swimmers may eventually settle down on the surface of a living host, penetrate its tissues, and form a monophagous bushy rhizoidal system within. The epibiotic body of the spore steadily enlarges and forms at maturity a thin-walled "ephemeral" sporangium; this produces zoospores somewhat smaller than those developed at the germination of the resting spores. These now apparently form only new ephemeral sporangia, which may also be formed by internal proliferation of discharged ones. About 5 days after the swarming of the zoospores from germinated resting spores, the first evidences are observed of the thallus on which the dark resting spores will be borne. Contrasted with the epibiotic thallus this one is polycentric—bearing numerous turbinate organs—and produces visible hypertrophy of the host plant.

Further observations on the mechanism of germination of the conidia of various species of powdery mildew at low humidity, H. J. BRODIE (*Canad. Jour. Res.*, 23 (1945), No. 6, Sect. C, pp. 198-211, illus. 7).—Collected data from observations by the author and others indicate that nine species of powdery mildew fungi

from 21 different host plants have been examined as to conidial germination at various humidities. Of these species, *Erysiphe graminis*, *E. polygoni*, *Uncinula salicis*, and *Microsphaera alni* seem beyond doubt to produce conidia capable of germinating at low humidity; according to published data, five species fail to tolerate low humidity. Conidia of *E. graminis* detached from the conidiophore but adhering in chains do not germinate as well as separate conidia from the same sample; the longer the chain, the lower the germination. In chains, it is usually the end conidia that germinate. These observations are discussed in the light of the author's theory (E. S. R., 87, p. 70) explaining the germination of powdery mildew conidia at low humidity. The apparent osmotic pressures of the cell sap of two powdery mildews were determined by plasmolysis with KNO_3 —for *E. polygoni* the figure obtained was 63 atmospheres; for *E. graminis hordei*, 68 atm. The significance of this high osmotic pressure is discussed. Study of the papillae regularly appearing on the end of the conidia of *E. graminis* indicated them to be special structures with a particular function; they should not be considered as germ pores. It is suggested that the conidium wall is two-layered, at least in the region between adjacent conidia; rupture of the outer part of the wall in a ring at the septum may serve to disjoin the conidia and form the papilla.

A comparative study of *Torulopsis pulcherrima* and *Taphrina deformans* in culture. C. ROBERTS. (Univ. Calif.). (*Farlowia*, 2 (1946), No. 3, pp. 345-383, illus. 32).—Both fungi presented a similar yeastlike appearance when grown at room temperature on potato dextrose agar and produced a reddish or pinkish noncarotinoid pigment—that of *Torulopsis pulcherrima* being diffusible and that of *Taphrina deformans* not. In *Torulopsis pulcherrima* a predictable mutationlike change involving the production of white sectors occurred with great regularity in pigmented colonies; in the other species unpredictable sectors involving a color change from pink to yellow occurred frequently but sporadically. These variants of both species were transmissible but failed to have complete stability. Cellular morphology and a mycelial tendency were essentially similar in cultures of both species; in old cultures cellular structures indicative of sporulation were noted and interpreted as ascogenous cells, asci, and ascospores. In *T. pulcherrima* a tendency for differentiation of the red and white cultural types on the basis of cellular morphology was noted and found correlated with the sporulation phenomenon; in *Taphrina deformans* no such morphological differentiation among the three types was evident. A constant uninucleate condition occurred in the young vegetative cells of both fungi. *Torulopsis pulcherrima* fermented glucose; *Taphrina deformans* did not. No evidence was obtained of physiological differences among the various cultural types of either species. On the basis of these findings the interrelationship of the two fungi is discussed with special reference to a recent proposal to remove *Torulopsis pulcherrima* from the imperfect yeasts to the Taphrinales.

Soil disinfection.—IV, Chemical treatment of glasshouse soil. H. JACKS (*New Zeal. Jour. Sci. and Technol.*, 27 (1945), No. 3, Sect. A, pp. 250-255, illus. 1).—In these further studies (E. S. R., 93, p. 723), chloropicrin, formalin (40 percent formaldehyde), Shell D-D, and CS₂ were used in treating greenhouse soil infested with root knot nematode and verticillium wilt of tomato; all but the formalin gave satisfactory control but at the dosages used did not eradicate the nematode when the soil contained undecayed infested roots. All treatments gave increased yields, chloropicrin proving best from this standpoint. Chloropicrin and formalin gave complete control of the wilt, but Shell D-D allowed a small percentage of infection. Results suggested that chloropicrin had also improved the soil fertility.

Fungicides and their action. J. G. HORSFALL (*Waltham, Mass.: Chron. Bot. Co.*, 1945, pp. 239+, illus. 24).—This textbook, which "has constituted for the author a postgraduate course on fungicidal action," is designed to consider two basic problems,

viz, "(1) to procure the proper materials for killing the enemy and (2) to deliver them to him in sufficient quantity when and where he is vulnerable." These two problems are discussed in the light of the chemistry and physiology of toxic action and of the mechanics of application. The illustrative examples, in general, are drawn from plant pathology, but in many cases reference is made to wood and fabric preservation, human pathology, bacteriology, and entomology. This is, however, "no cook book;" rather, it attempts to develop the underlying theory on which a practice is based and by which it may be improved. Following a historical introduction, the author deals with some general concepts, laboratory assay, some problems of data assessment, principles of chemical protection, deposition, coverage of single and of multiple surfaces, tenacity, artificial immunization and chemotherapy, the actions of copper, sulfur, organic nitrogen compounds, and of other organics. antagonism and synergism, and phytotoxicity. A bibliography of 22.5 pages and author and subject indexes are provided. A foreword is by D. Fairchild.

The fungicidal action of copper, R. L. WAIN (*Chem. and Indus. [weekly]*, No. 7 (1946), pp. 70-73, illus. 1).—This address reviews (36 references) the mechanism of the fungicidal action of Cu fungicides and the factors influencing it, including recent work by the author and his associates.

Progress in testing the relative effectiveness of new organic fungicides in the control of plant diseases—a summation of nation-wide data in 1945, H. P. BARSS ET AL. (*Washington, D. C.: Amer. Phytopathol. Soc., Potomac Div., 1946, pp. 21+*).—This report, prepared by the Fungicide Committee, Potomac Division, American Phytopathological Society, contains lists of the cooperators and of the fungicides tested and presents the results of trials with diseases of fruits, vegetables, ornamentals, and miscellaneous crops and with treatments for seeds and planting stock. A summary of results for promising newer fungicides is included.

Parasitism of *Xanthomonas translucens* (J. J. and R.) Dowson on grasses and cereals, J. R. WALLIN. (Iowa Expt. Sta.). (*Iowa State Col. Jour. Sci., 20* (1946), No. 2, pp. 171-193, illus. 12).—*X. translucens* was studied on grasses and cereals over a 4-yr. period (1941-44); it causes small water-soaked translucent areas enlarging into yellowish, brownish, or blackish somewhat irregular streaks on the leaves, culms, and young seedlings. The most characteristic symptom on all the hosts was a brown or blackish streaking of the foliage. "Xanthomonas streak" is proposed for the diseases induced by this organism on all grasses and cereals, replacing "bacterial blight" on barley and rye and "black chaff" on wheat. The organisms from brome-grass and timothy were established as a new variety and race, respectively, of *X. translucens*. In morphological, cultural, and biochemical characters these two forms were like the barley, rye, and wheat strains; they survived the winter on foliage in the field and infected new leaves in the spring. In comparative inoculation trials infection proved more consistent over a wider host range by the hypodermic than by the spray method. Six isolates of the brome race were found by cross-inoculation tests to be alike in reactions on the different hosts but distinct from *X. translucens cerealis*. Hagborg's *X. translucens* f. sp. *cerealis* is redescribed on the basis of the reactions of strains from barley, brome-grass, rye, and wheat on six host plant genera. Six pathogenic races of *X. translucens cerealis* were separated by cross-inoculation trials. These races all parasitized barley, *Bromus* spp., *Agropyron repens*, oats, rye, and wheat, but were separated by their reactions on 7 oats varieties and 13 *Bromus* spp., including 2 varieties of *B. inermis*; detailed results are given. There are 19 references.

The prevalence and control of seed-borne diseases of cereals in Manitoba, F. J. GREANEY and J. E. MACHACEK (*Sci. Agr., 26* (1946), No. 2, pp. 59-78, illus. 1).—In the interest of further information on the health of the seed of wheat, oats, and barley being grown in Manitoba, over 3,000 farm samples from the 1937-42

crops from all over the province were examined, and the results are presented in detail. *Helminthosporium* spp. were the predominating pathogens; pathogenic *Fusaria* were by no means commonly isolated. Seed treatment, particularly of oats and barley, was found inadequately carried out. The amount of infection of seed grain by smut, seedling blight, and leaf spot fungi varied appreciably from district to district and year to year, depending largely on the environmental factors where the seed was produced. Climatic conditions favoring early ripening and harvesting were followed by a low incidence of seed infection; warm humid weather during ripening and harvesting favored a high incidence of infection. Greenhouse tests of a large number of infected samples of wheat, oats, and barley seed with an organic mercury dust gave almost complete control of seed-borne *Helminthosporium* and *Fusarium* and favored germination of such samples; treatment of healthy seed proved of little value except where the seed was sown in heavily infested soil. The survey indicated that the health condition of the wheat, oats, and barley seed being produced and used annually in Manitoba is by no means satisfactory. The most important seed-borne diseases of cereals in the Province were the surface-borne smuts of oats and barley. In the absence of adequate facilities for determining the presence of smut or other pathogens on oats and barley seed, it is strongly recommended that all seed of these crops produced in Manitoba be treated with an approved disinfectant before being sown.

Tyrosinase enzyme in the causative agent of the black bacteriosis of cereals, A. P. KLYKOV (*Compt. Rend. (Dok.) Acad. Sci. U. R. S. S., n. ser., 47 (1945), No. 8, p. 597*).—The author evolved the hypothesis that the dark pigment in black chaff of wheat caused by *Bacterium translucens* is due to the action of tyrosinase. In a medium containing tyrosin, some 20 strains of *B. translucens* were grown to test the theory; after several days the culture assumed various shades from deepest black to yellow. The different strains contained varying amounts of the enzyme and in some cases none at all.

Étude biométrique de *Puccinia graminis* Persoon (rouille noire des Graminées), L. GUYOT (*Compt. Rend. Acad. Sci. [Paris], 220 (1945), No. 19, pp. 700-701*).—A biometrical study, comparing the uredio- and teliospores of *P. graminis* on various host plants spontaneously attacked, and revealing appreciable morphological differences.

Detection of the loose smut fungi in embryos of barley and wheat, P. M. SIMMONDS (*Sci. Agr., 26 (1946), No. 2, pp. 51-58, illus. 2*).—The problem of internally borne loose smut of barley and wheat is briefly reviewed, with special reference to two methods for detection in seed samples. The embryos are first removed by treatment with KOH or NaOH solutions: (1) In the whole embryo method they are dehydrated, cleared in cedar oil, and examined without staining; (2) in the sectioned method the embryos are embedded, sectioned en masse, and stained. Both procedures are said to give reasonably good results.

Destroy the rust-spreading barberry—protect small grains, M. A. CAMPBELL, R. W. BILLS, and B. KOEHLER. (Coop. U. S. D. A. and Ill. Expt. Sta.). (*Ill. Agr. Col. Ext. Cir. 598 (1946), pp. 16, illus. 9*).—An informatory circular telling how the rust spreads and how to identify and destroy the barberry, and discussing the increase in rust during warm muggy weather, resistant grain varieties, and the threat of new races of the rust fungus.

The effect of leaf rust of barley on the yield and quality of barley varieties, M. NEWTON, B. PETURSON, and W. O. S. MEREDITH (*Canad. Jour. Res., 23 (1945), No. 6, Sect. C, pp. 212-218*).—In tests of the effects of *Puccinia anomala* on the yield, grade, and malting quality of the barley varieties O. A. C. 21, Mensury, Chevron, Peatland, Regal, and Plush, the authors found that it reduced the first two by one commercial grade and caused significant reductions in yield and in bushel and

kernel weights of all the varieties except Mensury. It adversely affected the value of all varieties for malting by reductions in the proportion of heavy-grade kernels. The nitrogen content and wort N were reduced by leaf rust, but the malt extract and diastatic powers were not greatly influenced. Differential responses of the varieties to rust infection were observed in yield, kernel and bushel weights, and malt properties.

Effect of leaf and stem rust on the phosphorus metabolism of hard red spring wheat, A. HOFFER, W. F. GEDDES, and M. N. LEVINE. (Univ. Minn. coop. U. S. D. A.). (*Cereal Chem.*, 23 (1946), No. 1, pp. 52-64).—Total P determinations were made on the grain, chaff (glumes and rachides), and straw (stems and leaves) prepared from tillers harvested during kernel filling from plots of Thatcher and Marquis wheats variously infected with leaf and stem rusts. The rust epidemics were induced by inoculation and the intensity of spontaneous rust infection was controlled by periodic sulfur dustings. Average kernel weights and moisture contents of entire tillers were determined as indexes of progressive maturity. The average kernel weight was adversely influenced by severe rust infections—particularly from stem rust. Transpiration was accelerated more by stem rust than by leaf rust, even though the average maximum stem rust infection was 48.6 percent as compared with 89.5 percent for leaf rust. The percentage of P in the dry matter of the kernels remained more or less constant with progressive maturity; in the chaff its percentage tended to decrease appreciably as the plants approached maturity, whereas in the straw a very consistent and more pronounced decrease occurred. The total P in the entire tiller remained relatively constant during maturation, but it was translocated from the straw and chaff into the developing kernel; its translocation exceeded that of the other ash elements. Severely rusted plants contained somewhat more P in the grain than more lightly infected ones during the early stages of kernel development, but the differences were reduced as the maturity of the plant approached. Intensity of rust infection was without apparent influence on the percentage of P in the chaff, but caused a definite increase in its concentration in the straw during the final stages of maturation. The effects were similar for both leaf and stem rusts. Severe leaf rust infection, as for stem rust, lowered the total P content of the entire tiller and markedly interfered with its translocation into the kernels.

Four new recommended wheats which combine stem rust resistance with yield and quality (*Agr. Gaz. N. S. Wales*, 57 (1946), No. 1, pp. 3-6, illus. 4).—The outstanding feature of the current recommendation of varieties of wheat for sowing in the various wheat zones of New South Wales is said to be the inclusion of the four new varieties Gabo, Kendee, Yalta, and Celebration—all local developments which are described.

The effect of eyespot (*Cercospora herpotrichoides* Fron.) on wheat and the influence of nitrogen on the disease, M. D. GLYNNE, W. M. DION, and J. W. WEIL (*Ann. Appl. Biol.*, 32 (1945), No. 4, pp. 297-303, illus. 8).—The seasonal effects of eyespot on wheat receiving different amounts of N were studied in pot experiments. Plants inoculated in December exhibited chlorosis on the outer leaves in February. Among those with high N, eyespot killed 11 percent and caused straggling in 31 percent and whiteheads in 14 percent of the surviving ear-bearing straws; the straw yield was reduced by 8 percent and that of grain by 16 percent. Loss in straw was from reduction in number of plants; that in grain was due about equally to fewer ears and lighter grains. Among plants with low N, the disease killed 23 percent; it also caused straggling in 86 percent and whiteheads in 18 percent of the surviving ear-bearing straws and reduced the straw yield by 23 percent and that of grain by 44 percent. The loss in straw was due to death of the plants; that of grain, about two-thirds to fewer ears and one-third to lighter

grains. In the high-N series the number of shoots at maximum tillering was reduced by 29 percent; in the low-N series the height of the plants was reduced, the crop was very uneven, ear and anther emergence was delayed, and "tail corn" increased from 4 percent in controls to 30 percent in inoculated plants. All of the last became infected, but those receiving high N had only 49 percent of the ear-bearing straws with severe lesions at harvest; those on low N, 86 percent. The larger number of tillers produced with N applications may have enabled the less severely diseased shoots to survive and bear ears, while the most severely infected died.

An undescribed ear rot of corn caused by *Physalospora zeae*, A. J. ULLSTRUP. (Ind. Expt. Sta. and U. S. D. A.). (*Phytopathology*, 36 (1946), No. 3, pp. 201-212, illus. 3).—For several years an unidentified ear rot of corn was observed in Indiana. Isolates of *P. zeae* (*Macrophoma zeae*) from diseased corn leaves proved strikingly similar in cultural behavior, growth rate, and loss of viability to the fungus causing the ear rot. After a number of trials to induce sporulation in a wide variety of media held under different environments, the ear rot fungus finally produced pycnosporos after 4 months' incubation in pure cultures on sterilized corn-stalks. Pycnosporos produced by *P. zeae* and *M. zeae* on the same substrate were identical with those of the ear rot fungus. A third type of fruiting body was produced in pure culture by *P. zeae*, *M. zeae*, and the ear rot pathogen; this was a pycnidiumlike body bearing minute hyaline 1-celled oblong spores that did not germinate. Symptoms on ears inoculated with single-spore isolates of *P. zeae* and *M. zeae* and mass isolates of the ear rot fungus were indistinguishable from each other or from ears infected spontaneously. On the basis of similarity in morphology, cultural behavior, growth rate, and ear rot symptoms, it is concluded that *P. zeae* and *M. zeae* are the sexual and asexual phases of the same fungus, and that the heretofore undescribed ear rot pathogen is *P. zeae*.

Some factors in the production and germination of spores of *Diplodia zeae* in culture, G. C. KENT. (Iowa Expt. Sta.). (*Iowa State Col. Jour. Sci.*, 20 (1946), No. 2, pp. 259-263).—Production of pycnidia and formation of germinable conidia were found greatest when this fungus was grown on a thin layer of oatmeal-extract agar on the sides and bottom of an Erlenmeyer flask. Incubation in the light at 20° C. proved most favorable for developing a large number of germinable conidia. Spores washed in sterile distilled water germinated better than those not washed. Carrot extract was the most favorable for spore germination. Washed spores incubated in carrot extract germinated 90 percent after a 12-hr. incubation at 28°-30°. Uncovered ground glass slides were the most satisfactory for incubating spore suspensions.

Influence of carbohydrate levels and root-surface microfloras on phymatotrichum root rot in cotton and maize plants, F. M. EATON and N. E. RIGLER. (U. S. D. A. coop. Tex. Expt. Sta.). (*Jour. Agr. Res* [U. S.], 72 (1946), No. 4, pp. 137-161, illus. 5).—In both pot and field experiments the resistance of cotton plants of fruiting age to phymatotrichum root rot proved directly related to the carbohydrate content of the root bark; when the levels were increased sufficiently by the removal of bolls and branches and withholding N, *Phymatotrichum omnivorum* disappeared from previously infected parts of the root system. With increased carbohydrate levels, marked changes occurred in the root surface microflora, the total numbers of bacteria and spores of aerobic bacilli decreasing and the blue-green fluorescent bacteria increasing greatly. This type of resistance in cotton is attributed to an increased antibiotic activity of the saprophytic microflora of the root surfaces. The resistance of young cotton plants to *Phymatotrichum* is evidently chemical, since it was not altered by changes in carbohydrate levels or when the plants were grown in sterile sand-bentonite. The significance of the

antibiotic factor in disease resistance is illustrated by experiments with corn—a plant long regarded as immune to root rot: The roots of corn growing in sterile sand-bentonite were rapidly destroyed and the plants killed when *P. omnivorum* was introduced; in soil-inoculated cultures, on the other hand, the roots remained bright even though paralleled for long distances by strands of the fungus. There are 35 references.

Zinc deficiency in flax, C. R. MILLIKAN (*Jour. Dept. Agr. Victoria*, 44 (1946), No. 2, pp. 69-73, 88, illus. 5).—Zinc deficiency has occurred in flax crops in certain parts of Victoria, Austral. Its alleviation by ZnSO_4 applications was demonstrated in the field. The symptoms may involve dieback, bronzing, or rosetting. Characteristically, the affected plants "recover" in spring and make prolific and healthy second growth; in water cultures no such "recovery" has been observed. Time of sowing was found to have a very significant effect on the incidence of the deficiency symptoms. Superphosphate dressings in themselves had no effect on incidence, but when applied in conjunction with 30 lb. of ZnSO_4 per acre the superphosphate at 10 cwt. per acre induced a significant increase in the percentages of both dieback and total Zn-deficiency symptoms.

Breeding potatoes resistant to disease, F. J. STEVENSON. (U. S. D. A.). (*Natl. Hort. Mag.*, 25 (1946), No. 1, pp. 18-28, illus. 6).—Following introductory remarks on the origin of the potato and its introduction into North America and Europe, the author discusses early improvement efforts and the results of more recent breeding and selection work, with information on some of the newer varieties and a listing of characters now available to plant breeders in the United States. Varieties are now available that are resistant to the following diseases and insects: Mild mosaic, latent mosaic, rugose mosaic, net necrosis in the tubers caused by current-season infection with the leaf roll virus, yellow dwarf, late blight of the vines, tuber rot initiated by the fungus that causes late blight, common scab, potato wart, rot, ring rot, hopperburn, flea beetle injury, and aphid injury—a list that continues to grow as new varieties and species are now being introduced from many other countries.

En del vanliga potatissorters reaktion mot vissa vira [The reactions of some common potato varieties to certain viruses], H. ESBO (*K. Lantbr. Akad. Tidskr.*, 84 (1945), No. 4, pp. 299-313; *Ger. abs.*, pp. 309-310).—The foliage and tuber reactions of 12 varieties to the X plus Y virus combination were tested.

Spray materials and the blooming of potatoes, J. D. WILSON and J. P. SLEESMAN. (Ohio Expt. Sta.). (*Amer. Potato Jour.*, 23 (1946), No. 2, pp. 57-64).—Bordeaux caused the greatest decrease and DDT the greatest increase in bloom of the materials used in this study. All Cu-containing fungicides decreased the bloom when used with calcium arsenate, but some of the organic fungicides like Zerlate and Fermate caused a slight increase. Addition of DDT to the Cu fungicides decreased their depressing effects on bloom but did not entirely counteract it. Combinations of DDT with the organic fungicides all increased the bloom, Zerlate plus DDT nearly doubling it. Bloom was least persistent in plants treated with Cu plus calcium arsenate and lasted much longer with organic fungicides plus DDT. Persistence was most marked with DDT alone, being greatest at 1-100 (the highest concentration used) applied 200 gal. to the acre. The bloom increased with each increase in amount of DDT used from $\frac{1}{8}$ to $1\frac{1}{2}$ lb. per acre per application; DDT emulsions were somewhat less effective than wettable powders. The flower clusters were fewer on plants treated every 20 days than on those sprayed at 10-day intervals. There was little or no correlation between bloom and yield on plots treated with combinations of fungicide and either calcium arsenate or DDT. With DDT alone the plots exhibiting the heaviest flower production also produced the most tubers. The Cu formulas seemed to depress flowering by some unfavorable physiological

action, but they increased tuber production by giving the foliage continued protection from injury by diseases and pests after flowering had occurred. DDT, on the other hand, encouraged heavy vegetative growth throughout and maintained a considerable leaf area until early blight finally killed the plants at the very end of their normal growth period—which persisted in this instance for at least 15 days beyond the usual 90 days for Cobblers at Wooster, Ohio.

Potato spray and dust experiments in 1945, J. C. CAMPBELL and R. S. FILMER. (N. J. Expt. Stas.). (*N. J. State Potato Assoc., Hints to Potato Growers*, 26 (1946), No. 10, pp. [4]).—It was evident from a single spray test on Katahdin potatoes that DDT with either bordeaux or Microgel may be expected to increase yields substantially even in the absence of severe insect infestation; Dithane, though inferior in controlling flea beetles and late blight, produced a favorable yield; Microgel was almost equal to bordeaux against late blight and produced slightly higher yields; basic copper arsenate was inferior to all of the other materials. In the dust trials Microgel-talc was equal to or better than the copper-lime dusts; DDT with a neutral copper increased the yield appreciably, but with a copper-lime it did not; 666 failed to produce outstanding results but is considered worthy of further trial as an insecticide. None of the dusts except DDT-Microgel gave as high a yield or as good control of late blight as did bordeaux.

The effect of disinfecting and bruising seed potatoes on the incidence of dry rot (*Fusarium caeruleum* (Lib.) Sacc.), T. SMALL. (*Ann. Appl. Biol.*, 32 (1945), No. 4, pp. 310-318).—The effect of bruising and disinfecting ("dipping") seed tubers with a proprietary organo-mercury preparation on the incidence of dry rot was tested in field trials over three seasons. If left undisturbed in their boxes, seed tubers not deliberately bruised—whether dipped or not at harvest—remained practically sound until planting time the following season. Those deliberately bruised—either at digging time or 1 to 2 weeks later but not dipped—with few exceptions developed severe dry rot; the disease had run its course by mid-October. When undipped sound tubers were bruised in October, they contracted severe dry rot, but dipping them immediately before bruising reduced the loss satisfactorily in five or six trials. In almost all cases, tubers bruised at digging time and immediately dipped suffered little from dry rot; delayed dipping checked the disease in some trials but not in others. Seed tubers severely bruised 1 to 2 weeks after dipping remained practically sound (one exception); those severely bruised about 3 mo. after dipping subsequently developed severe dry rot in four of six tests—unless they had been redipped immediately before they were bruised. Inoculation of healthy tubers with soil samples indicated the fungus to be widely distributed in Cheshire (England) potato fields; dipping killed all or nearly all of the fungus in soil adhering to the tubers. The findings are discussed, and suggestions are made for further investigations and practical control.

A comparison of *Fusarium avenaceum* and *Fusarium caeruleum* as causes of wastage in stored potato tubers, F. J. MOORE (*Ann. Appl. Biol.*, 32 (1945), No. 4, pp. 304-309, illus. 1).—*F. avenaceum* is reported for the first time as a cause of potato tuber rot in Britain; the progress of decay in infected tubers is compared with the dry rot due to *F. caeruleum* in the laboratory, clamp, and potato store. Of the varieties Majestic, King Edward, Arran Pilot, and Doon Star, the last was most susceptible to *F. caeruleum* and King Edward to *F. avenaceum*. Optimum growth temperatures on potato-dextrose agar were 20°-25° C. for *F. avenaceum* and 20° for *F. caeruleum*; maxima were >30° and 30°, respectively. For infection of wounded tubers, the cardinal temperatures for *F. avenaceum* were like those on agar; for *F. caeruleum* the optimum was 15° and the maximum 25°. With both, the optimum for rotting tended to be higher in the more susceptible varieties. At low temperatures *F. caeruleum* caused quicker rotting than *F. avenaceum*, even

though its growth rate on agar was scarcely more than half that of the latter. High humidity favored rotting, especially with *F. avenaceum*; the other fungus was more tolerant of relatively low humidity. Both species caused quicker rotting in the clamp than in storage, even though there was no appreciable difference in mean temperature; this was attributed to the higher atmospheric humidity in the clamp.

Field trials of copper fungicides for the control of potato blight.—I, Foliage protection and yield, E. C. LARGE (*Ann. Appl. Biol.*, 32 (1945), No. 4, pp. 319–329, illus. 4).—Recent technics of disease measurement on foliage were applied and developed and characteristic curves obtained defining the conditions of trial and the relations between spray timing and progress of late blight attack. The time interval between half-decay dates for sprayed and unsprayed foliage was taken as a numerical criterion of the direct protective effect of treatment. A linear relationship was found to hold between probit foliage decay and time, and this was accounted for by the close correspondence of the probit curve to that derived from a growth law, $da = Ca(A-a)dt$, where a denotes the percentage foliage area affected by blight at time t after the beginning of the attack. Methods were found for preparing dispersible mixtures of bentonite with active Cu compounds for use in spraying. With such admixture—to improve adhesion—both cuprous oxide and copper oxychloride preparations nearly equaled bordeaux at the same Cu dosage. Without sticker, and compounded with water-soluble dispersing agents, these materials were equaled by bordeaux at half their Cu dosage. Suspensions of metallic Cu had a pronounced fungicidal effect against *Phytophthora infestans*; a bearing of this result on the fungicidal mechanism of cuprous oxide is discussed. Results from 103 pairs of twice-sprayed and unsprayed plots of main-crop potatoes (1941–44) showed a mean prolongation of growth from spraying of 16.5 days and a mean gain in total yield of 2.75 tons per acre; the gain in yield from a given prolongation of growth, however, varied greatly according to the stage of the crop development at which this prolongation began. Spray retention data—for correlation with foliage protection and yields—were obtained for all 4 yr.

Ensayos del caldo bordelés contra la *Phytophthora infestans* (Mont.) de Bary en *Solanum tuberosum* [Trials with bordeaux against late blight of potato], J. A. BERTA and H. D. TOBLER BOTTINI (*Rev. Asoc. Ingen. Agrón. [Montevideo]*, 17 (1945), No. 4, pp. 3–11, illus. 6; *Eng. abs.*, p. 11).—At rates of 0.5, 1, and 2 percent CuSO_4 and with neutral and slightly and highly alkaline reactions, it was found that the reaction of the bordeaux did not interfere with the yields, but neutral and slightly alkaline mixtures resulted in injury when applied on wet days. Best yields followed use of the 1 percent formula.

Ring-rot-like symptoms produced by soft-rot bacteria in potato tubers, R. S. DAVIDSON. (Minn. Expt. Sta.). (*Phytopathology*, 36 (1946), No. 3, pp. 237–239, illus. 1).—Symptoms resembling those from infection by *Corynebacterium sepedonicum* were produced by *Erwinia carotovora* in mature potato tubers which had been subjected to flooded field conditions.

Sclerotium rot of potato seed pieces, A. H. EDDINS and E. WEST. (Fla. Expt. Sta.). (*Phytopathology*, 36 (1946), No. 3, pp. 239–240, illus. 1).—*S. rolfsii* attacked potato seed pieces in a Florida field planted to Sebago potatoes after a crop of cabbage had been harvested. This is believed to be the first report of the spontaneous occurrence of sclerotium rot of seed pieces in the field.

Trials of potatoes for immunity from wart disease (Agriculture, Jour. Min. Agr. [Gt. Brit.], 52 (1946), No. 10, pp. 475–476).—The official trials of new varieties for immunity to wart disease were continued in 1945, and seven new varieties—here described—are added to approved list.

The life history of the golden nematode of potatoes, *Heterodera rostochiensis* Wollenweber, under Long Island, New York, conditions, B. G. CHITWOOD and E. M. BUHRER. (U. S. D. A., [N. Y.] Cornell Expt. Sta., et al.). (*Phytopathology*, 36 (1946), No. 3, pp. 180-189, illus. 4).—Eggs and larvae overwintered in the soil within the body of the dead female which acted as a cyst. When the mean weekly temperature reached about 59° F. in spring, the eggs hatched and the larvae emigrated from the cyst to attack potato roots. Thereafter they underwent various growth stages, reaching maturity and producing embryonated eggs within 38 to 48 days. Whether or not more than one generation may occur in a year is unknown. Evidence is presented that in seasons with a short spring there is more damage to potato yields than in those with a long spring. Potatoes may be capable of growth at 45° to 58°, at which temperatures there is little or no nematode activity.

Blind-seed disease of rye-grass (*Phialea temulenta* Prill. & Delacr.), E. L. CALVERT and A. E. MUSKETT (*Ann. Appl. Biol.*, 32 (1945), No. 4, pp. 329-343, illus. 13).—A brief review of the present status of knowledge on the disease is given, and methods for examination of the seed are described. *P. temulenta* was isolated by germinating macroconidia and ascospores as well as from mycelium within the seed, grown in culture, and the fungus and its life history are described. Inoculations (1940-41) proved its pathogenicity and the saprophytic nature of *Pullularia pullulans*. Italian ryegrass, commercial perennial ryegrass, and two strains of pedigree perennial ryegrass all proved susceptible when inoculated at flowering time with either macroconidia or ascospores. Tested on commercial perennial ryegrass, the amount of infection was much reduced on inoculation after flowering had ceased. The correlation coefficient between percentage infection and germination was calculated and in all cases proved highly significant—negative correlation indicating that infection results in reduced germination. *P. temulenta* has been isolated from *Festuca ovina*, *Agrostis canina*, *A. palustris*, *Poa pratensis*, *Holcus lanatus*, and *Cynosurus cristatus*, while *F. elatior* and *P. trivialis* were successfully inoculated in 1943 using macrospores of the fungus. Control by breeding resistant strains and by crop management are discussed. The fungus is probably nonviable in over-year seed samples. In field tests, hot-water treatment of the seed prevented the production of apothecia, but infection occurred because of the dispersal of ascospores from other plots. A later test indicated the fungus to be widespread in pastures, waste ground, and hedgerows, rendering treated seed no guarantee of a healthy seed crop. Use of organo-mercury disinfectants applied dry or by the short wet method proved only partially effective. Hot water for 15 min. at 50° C. following a 4-hr. preimmersion in tepid water, or for 30 min. at 50° without preimmersion, provided complete control, and germination was in no case impaired when the seed was thoroughly dried at once.

The fungus that causes sooty stripe of Sorghum spp., L. S. OLIVE, C. L. LEFEBVRE, and H. S. SHERWIN. (U. S. D. A.). (*Phytopathology*, 36 (1946), No. 3, pp. 190-200, illus. 4).—Since studies have shown the fruiting body of the sooty stripe fungus of sorghum to be a sporodochium, the fungus (*Septorella sorghi*) is transferred from the Melanconiales to the Tuberculariales as *Ramulispora sorghi* n. comb. The typical leaf spots produced begin as small oblong reddish-purple spots that develop into conspicuous elongate lesions with purplish borders and straw-colored centers of dead tissue. This dead tissue bears small black sclerotia which often impart a sooty appearance to the lesion. The fungus overwinters via these sclerotia. The conidia produced in spring appear to be largely responsible for initiating primary infections. Typical lesions with sclerotia, sporodochia, and conidia were readily produced by inoculating several varieties of sorghum, Johnson grass, and Sudan grass in the greenhouse.

The transmission of beet mosaic and beet yellows viruses by aphids: A comparative study of a non-persistent and a persistent virus having host plants and vectors in common, M. A. WATSON (*Roy. Soc. [London], Proc., Ser. B, 133 (1946), No. 871, pp. 200-219, illus. 1*).—The vector (green peach aphid) of beet mosaic becomes most infective when fed only a few minutes on diseased plants after a period of fasting. After such feeding, the infectivity is very rapidly lost when the vector feeds on healthy plants, but a single individual is capable of infecting several plants. Infectivity is lost much more slowly when the vector fasts after an infective feeding. In this behavior beet mosaic virus resembles Ily 3, potato Y, cucumber 1, and other aphid-transmitted viruses, which have been called the non-persistent group; it resembles these viruses also in physical properties. In some secondary characters beet mosaic differs from the other nonpersistent viruses more than they differ among themselves; it is retained longer by the fasting vectors and their infectivity may increase considerably with lengthening of the infective feeding time in the absence of the preliminary fasting, though it very rarely reaches the optimum level.

In the case of beet yellows virus, infectivity of the vector (also the green peach aphid) is not influenced by a preliminary fasting but always increases with lengthened feeding time on both infected and healthy plants. Infectivity increases with feeding time on healthy plants, whatever the infective feeding time; there is always a delay, therefore, in the production of optimum infectivity by the aphid after cessation of the infective feeding. Infectivity is more rapidly lost from fasting than from feeding vectors. Its properties indicate that this disease belongs to the persistent group of viruses, although its persistence in the fasting vector is only about the same as that of the nonpersistent beet mosaic virus. The main basis of distinction between the two types seems not to lie in the time they are retained by the vector but in the effect of preliminary fasting. Since the two diseases have the same vector and host plant, the differences in their behavior are properties of the viruses themselves and are not induced by the conditions under which they are transmitted.

Epiphytology and control of sugar beet leaf spot caused by *Cercospora beticola* Sacc., C. M. NAGEL (*Iowa Sta. Res. Bul. 338 (1945), pp. 677-706, illus. 10*).—In eight different spacings on a loam soil, leaf spot development, sugar beet yield, and sucrose content were studied over a 5-yr. period (1933-37); in a similar way the number of plants per hill in three different spaces, for 4 yr. Wide spacing gave evidence of reducing the prevalence of leaf spot under moderate infection. The disease varied in prevalence and destructiveness with the weather conditions. In 1933, 1934, and 1937 it caused less injury to the leaves in the wider than in the narrower spacings. In 1935—a wet season—a serious epidemic occurred, infection being prevalent and destructive in all spacings. In 1936—a dry season—little or no leaf spot developed in any of the plots; the differences in yield appeared to be due partly to spacing and partly to leaf spot. With the possible exception of the 21- × 21-in. spacing in 1937, yields did not differ significantly in the spacings now commonly used, viz, 12 × 21, 18 × 18, and 21 × 21 in.; these spacings were used in 1935-37. The leaf spot severity tended to increase with the number of plants per hill. In each year wider spacings produced beets of greater size than in the closer spacings, although the acre yield was usually less. The acre yield was practically the same with one and two plants per hill; with more than two, the roots were reduced below marketable size. The sucrose percentage varied only slightly with difference in spacing and number of plants per hill.

Soil populations of beet eelworm (*Heterodera schachtii* Schm.) in relation to cropping, F. G. W. JONES (*Ann. Appl. Biol., 32 (1945), No. 4, pp. 351-380, illus. 19*).—The sampling technic used and investigation of the various steps of which it

is imposed are first discussed; this is followed by the results of applying the method to 24 fields, 1937-42. There appeared to be a correlation of the general level of the nematode population with the frequency of preceding susceptible crops and the amount of crop damage. Marked increases followed the planting of susceptible crops on heavily infested land; smaller increases occurred in fields with low initial populations. Fields which are completely "beet-sick" require over 10 yr. before sugar beets can again be grown with safety. The general effect of non-susceptible crops was to lower the nematode populations; cereals had the same effect but to a lesser extent. "Claying" had a beneficial effect. Crucifers proved capable of increasing the beet eelworm population, although they did not as a rule show signs of distress when growing on land where sugar beet developed the signs of "sickness." A strong correlation was observed between the viable cyst and egg content of bulk samples, suggesting that viable cysts are a better measure of the general level of nematode population than might have been supposed. Cysts decay slowly and remain in the soil long after they are devoid of living contents. The best measure of populations yet devised is an estimate of the encysted egg population; it is not nearly so satisfactory, however, in forecasting damage to an ensuing crop. In examining cysts for viability, fungus hyphae and the fruiting bodies of other organisms were found inside; it is believed that at least some part of the microcyst population of soils is composed of fruiting bodies of fungi of the order Chytridiales. Another organism—probably a fungus—had a rather high incidence and might be important in reducing the egg populations. Experience suggests that the general level of the egg population above which it is unsafe to grow sugar beets or mangolds on Fen soils is about 10 eggs per gram of air-dried soil or approximately 0.1 viable cyst per gram.

Tobacco rosette: A complex virus disease, K. M. SMITH (*Parasitology*, 37 (1946), No. 1-2, pp. 21-24, illus. 10).—The name "tobacco rosette" is suggested for the composite disease studied. The two component viruses—named the "mottle" and "vein-distorting" viruses—were separated, and their symptomatology and methods of transmission are described. The former is both sap- and aphid-transmitted; the latter, aphid-borne only. The symptoms are of three main types: Intense rosetting, splitting of the tissues, and formation of enations on the lower leaf surface. Tissue splitting was examined microscopically and is illustrated. It is suggested that the virus concentration in the cambium prevents the formation of normal xylem. Abnormal tissue and giant cells are formed in the cortex and pith; this apparently sets up stresses which cause the splitting. The green peach aphid is the main vector; another species, *Myzus pseudosolani*, is a less efficient transmitter.

Purification and crystallization of southern bean mosaic virus, W. C. PRICE (*Amer. Jour. Bot.*, 33 (1946), No. 1, pp. 45-54, illus. 5).—This virus (*Marmor laesiofaciens*) is distinguished from other plant viruses on the basis of its high degree of thermostability, the symptoms produced, and the host range. Cross protection tests indicated that it is not closely related to tobacco mosaic or necrosis or to the alfalfa mosaic viruses, though it resembles each in some respects. The virus was concentrated and purified either via alternating cycles of high and low speed centrifugation or by fractionation—with essentially identical end products. The purified virus appeared homogeneous on examination in an analytical centrifuge, an electrophoresis apparatus, a diffusion apparatus, and an electron microscope. Such preparations gave positive tests for protein and negative tests for carbohydrate and contained spherical particles having a mean diameter of about 33.6 mμ; they remained active for months when held at 3° C. but soon became noninfectious when frozen. Crystallization was done by centrifuging purified preparations—brought to about 20 percent saturation with MgSO₄ or (NH₄)₂SO₄—at 24,000

r. p. m. to obtain amber-colored pellets, draining off the supernatant fluid, adding only one or two drops of water, and allowing to stand for several hours at 3°. The crystals were either rhombic bipyramids joined by two pinacoids or rhombic prisms—both probably belonging to the orthorhombic system though neither showed birefringence under a polarizing microscope. Solutions of the crystals were highly active and produced typical symptoms of southern bean mosaic. There are 31 references.

The effects of soil moisture and temperature on fusarium wilt of tomato, M. C. STRONG. (Mich. Expt. Sta.). (*Phytopathology*, 36 (1946), No. 3, pp. 218-225, illus. 2).—During a 10-yr. study of the fusarium wilt disease of tomato in connection with a breeding program for wilt-resistant varieties, the author observed that John Baer (susceptible) and Marglobe (resistant) have opposite responses to soil moisture as far as it affects susceptibility to wilt. Marglobe had more wilt infection under less rainfall; John Baer, in seasons of greater rainfall. Tests with these varieties under controlled temperature and moisture substantiated the field observations. Their responses to wilt v. temperature were similar. There are 19 references.

* **Root diseases of deciduous fruit trees,** J. S. COOLEY. (U. S. D. A.). (*Bot. Rev.*, 12 (1946), No. 2, pp. 83-100).—The object of this review (59 references) is to present briefly the current status of information on the subject, emphasis being placed on the diseases rather than on the mycological aspects of the pathogens—on the host and the effects of various environmental factors on its resistance or susceptibility. The author has attempted "to make this discussion world-wide in its scope and application." The main headings concern pome fruits, stone fruits, and nonparasitic diseases; a final section includes a general discussion, with remedial measures.

Cost studies show airplane dusting is practical, F. C. STRONG and E. J. RASMUSSEN. (Mich. State Col.). (*Food Packer*, 26 (1945), No. 13, pp. 63-64, 66, illus. 2).—This account of 1 year's tests on orchard trees shows the costs of airplane dusting in materials used and in distribution to be very reasonable and not likely to deter an orchardist from use of the method. A rate of 20 acres dusted per hour was maintained in some applications in the larger orchards used.

Experiments with new organic fungicides for control of apple scab and Brooks' fruit spot (*Phoma pomii*), R. H. DAINES and S. L. HOPPERSTEAD. (N. J. coop. Del. Expt. Stas.). (*Phytopathology*, 36 (1946), No. 3, pp. 236-237).—In Delaware tests during 1944, No. 604 (2,3-dichloro-1,4-naphthoquinone) and Puratized N5-X (phenyl mercuri triethanol ammonium lactate) equaled liquid lime-sulfur in apple scab control. Ferimate alone and in combination with sulfur and Isothan Q-15 equaled the standard wettable sulfurs in providing protection against scab. He 175 (disodium ethylene bisdithiocarbamate) alone or in combination with zinc sulfate-lime failed to provide satisfactory control. The scab control in the New Jersey tests was in the same order except that 604 and Isothan Q-15 were somewhat less satisfactory. In Delaware, Puratized N5-X was shown to have eradicant value equal to lime-sulfur. In New Jersey, Thiosan, Ferimate, and lead dimethyl dithiocarbamate gave excellent control of Brooks' fruit spot when used at the 17-, 27, and 37-day (after petal fall) applications; they proved compatible with summer oils, as was also Isothan Q-15; 604 and oil caused severe injury, while Puratized N5-X and oil produced mild fruit russetting. Lime in combination with Ferimate increased fruit russetting somewhat during one year in three.

Ground treatments as an aid in apple scab control, D. H. PALMITER (*New York State Sta. Bul.* 714 (1946), pp. 27, illus. 6).—Control experiments indicated that the quantity of spores of *Venturia inaequalis* in overwintered apple leaves in a year favorable for disease development may determine the success or failure

of the scab control program. Orchards in which less than 5 percent of the old leaves contained spores were well protected from infection with five to seven ground applications of wettable sulfur. Similar orchards with more abundant inoculum required extra fungicidal applications and higher S concentrations for equal control. Nine yr. of laboratory and field tests showed the effectiveness of certain chemicals in killing or preventing ascospore discharge. Nitrogen fertilizers (e. g., nitrate of soda, sulfate of ammonia) used at 12 percent concentration were effective, but the 500 to 600 lb. required per acre for effective coverage increased the N supply available to the trees beyond the optimum for best fruit quality. Elgetol at 2 qt. to 100 gal. reduced the primary inoculum more than 95 percent when carefully applied and resulted in improved scab control. The ground treatments proved most effective in years of excessive rainfall; they reduced the amount of fruit infection on trees receiving a wettable sulfur program from 20 percent to 2 percent.

Sur le mode de contamination du poirier par les conidies de *Venturia pirina* Aderhold [The mode of contamination of pears with conidia of *V. pirina*], L. GUYOMARD (*Compt. Rend. Acad. Sci. [Paris]*, 220 (1945), No. 24, pp. 858-860).—The author's observations show that the first conidia of the pear scab fungus appear at the end of winter, even before the ascospores, in pustules on twigs of the preceding year. It seems probable that these pustules afford ports of entry for the *Nectria ditissima* of pear canker. A suggested spray program is given.

Sur la catalase des feuilles de *Prunus persica* et ses variations dans les tissus atteints de chlorose spécifique des sols calcaires [The catalase of peach leaves and its variations in tissues affected by the specific chlorosis of calcareous soils], G. DROUINEAU and P. GOUNY (*Compt. Rend. Acad. Sci. [Paris]*, 221 (1945), No. 23, pp. 709-710).—A brief report on the effects of temperature, pH, and HCN on the activity of the catalase and its content in the chlorotic leaves. The concentration of catalase at the beginning of the growing season was found to be the same in both healthy and affected leaves, but to decrease rapidly in the chlorotic leaves starting about mid-May and finally decreasing to about a fourth that in the normal leaves. This diminution of catalase had no relation to the respiratory intensity. A similar situation was observed in chlorotic leaves of quince and pear on calcareous soil.

A new disease of Russian olive in the Pacific Northwest, H. W. MILLER. (U. S. D. A. coop. Univ. Idaho and Wash. Expt. Sta.). (*Jour. Forestry*, 44 (1946), No. 2, pp. 118-120).—The author reports *Elacagnus angustifolia* in the intermountain area of Washington, Idaho, and Oregon to be attacked by a previously unreported disease, the first and most characteristic symptom of which is arrested bud development. The following year affected portions of a branch are dead; the arrested bud development follows progressively down the branch until the root collar is reached and the whole plant is killed. Another symptom consists of small brown necrotic areas just outside the phloem and usually on the lower side of diseased stems. Preliminary studies have failed to reveal the cause and a survey of the literature showed no record of such a disease of this plant; these studies have given no evidence of a relationship to influences of site condition, soil type, rainfall or temperature extremes, or deficiencies of minor elements, nor have attempts to isolate a possible parasite or to find a disease-free strain been successful. No definite record has been found of its occurrence in irrigated plantings. The disease constitutes a threat to continued use of this shrub or small tree for shelter belt and other plantings in the Pacific Northwest.

Phytohormones et court-noué de la vigne, F. NYSTÉRAKIS (*Compt. Rend. Acad. Sci. [Paris]*, 221 (1945), No. 2, pp. 54-56).—In the author's experiments, treatment with heteroauxin was followed by the development of symptoms resembling those of court-noué. This result is believed to favor the theory that the malady results

from a hormonal disequilibrium—either in a parasite or in some other factor. The theory thus permits an explanation of the same general effect resulting from the most diverse causes, viz, that the ultimate origin of the trouble is hormonal.

Coconut diseases in Jamaica.—I, "Bronze leaf wilt" and other diseases affecting the bud of coconuts. II, Diseases affecting the leaves, crown, and stem of coconuts, E. B. MARTYN (*Trop. Agr. [Trinidad]*, 22 (1945), Nos. 3, pp. 51-59, illus. 3; 4, pp. 69-76).—In part 1 the author considers diseases involving the rapid death of the bud and including bud rot, lightning strike, and bronze leaf wilt. The last is potentially the most serious disease of coconuts yet recorded in the West Indies. Although, pending the discovery of its exact nature, it is impossible to be certain that the varying symptoms recorded in different areas originate in identical causes, it is believed that they are closely allied, and that when the solution is found in one locality it will enable the problem of this puzzling disease to be solved elsewhere. According to the results of studies reported, the disease at first glance appears to be correlated with soil conditions, but the extremely varied soil types on which it occurs would seem to invalidate this hypothesis; on the other hand, no parasitic organism or virus has yet been proved responsible. The history of coconut cultivation in Jamaica is outlined, as well as the general methods at present practiced—often consisting of a combination of cattle pasture and coconuts.

In part 2 the author takes up the diseases affecting emerging leaves. These include two main types of the "bitten leaf" disease, the causes of which seem not to be fully agreed upon; and a condition variously known as St. Mary disease, wet weather disease, leaf disease, or leaf stalk rot—apparently attributable to environal conditions but often involving secondary invaders. Another group comprises diseases of the whole crown and older leaves, including leaf spots, dieback, leaf blight or silver tip, drought wilt, leaf break, yellowing, pencil point or little leaf, and false wilt. A final group—diseases of the stem—includes stem bleeding associated with *Thielaviopsis* and a leaf scar trouble associated with *Cytospora*. A general key for identifying the diseases of coconut palms in Jamaica is provided. There are 25 references.

Azalea petal-blight can be controlled, [I], II, C. WESTCOTT (*South. Florist and Nurseryman*, 58 (1945), Nos. 23, pp. 5, 37-38, illus. 3; 24, pp. 6, 14-15, illus. 1).—Part 1 considers the history of the disease, how the fungus works, the weather relations, and control. In part 2, the author states that, though sanitary measures and use of mulches have failed in controlling this flower spot, properly timed protective spraying has proved successful. Of the many new wartime chemicals tested, Dithane and 604 are said to have given almost complete control with a minimum of injury or unsightly residue. Consistently good results were obtained in 2 years' testing in many different gardens.

Het Botrytis-rot der gladiolen veroorzaakt door *Botrytis gladiolorum* nov. spec., A. S. TIMMERMANS ([*Netherlands*] *Lab. Bloembollen Onderzoek, Lisse*, No. 67 (1941), pp. 32+, illus. 24; *Ger., Eng. abs.*, pp. 29-30).—This disease, known for several years in the Netherlands, is reported to have suddenly become serious. Infection spreads along the vascular bundles of the leaves and stem to the corm, which may show symptoms of rot at the center. From all infected parts a *Botrytis* differing from *B. gladioli* was isolated and is described as *B. gladiolorum*. Many of the newer varieties are more susceptible to the disease. Storage tests indicated the earlier harvested corms to be less frequently infested with the fungus; under storage at 25.5°-30° C. the corms dry rapidly and the disease scarcely spreads at all.

Investigations on virus-diseases of narcissus, E. VAN SLOGTEREN and M. P. DE B. OUBOTER ([*Netherlands*] *Lab. Bloembollen Onderzoek, Lisse*, No. 64 (1941), pp. 18, illus. 32).—This paper was written for the Daffodil Yearbook (1940); trans-

mission of the manuscript having been impossible on account of the war, it was published locally. Here the authors detail their experimental findings, including inoculation experiments, factors influencing the disease symptoms, mode of spread, and control.

Onderzoekingen over virus-ziekten in bloembolgewassen, II, tulpen, I [Investigations of the virus diseases of flowering bulbs, II, tulips, I], E. VAN SLOGTEREN and M. P. DE BRUYN OUBOTER ([Netherlands] *Lab. Bloembollen Onderzoek, Lisse, No. 65 (1941), pp. 54, illus. 62; Ger., Eng. abs., pp. 49-52*).—In a historical survey of the literature (35 references) it is pointed out that as far back as 1637 the Dutch bulb growers knew how to transmit the symptoms of breaking in tulips; this is the oldest virus disease of plants known to botanical literature. A description of the symptoms is given, and the confusion in terminology is criticized. The ways of transmission are discussed from the results of many experiments, and it is concluded that in the Netherlands the chief agent of spread is *Mycus persicae* and to a lesser degree *Macrosiphum euphorbiae* and *Doralis fabae*. The technic of inoculating tulips at an early stage to obtain current season symptoms is fully described. All factors favoring aphid development and exposure of tulips to their attack increase the danger of spreading the disease, which is also transmitted by the cutting of the blooms. It is believed that two closely related strains of one virus are involved rather than two distinct viruses. The use of serological methods of study is recommended. Roguing diseased and suspected plants before the aphids appear is advised. Stocks not entirely free from infection should not be grown near other crops frequented by the vectors.

Resuscitation of the nematode *Tylenchus polyhypnus* n. sp. after almost 39 years' dormancy, G. STEINER and F. E. ALBIN. (U. S. D. A.). (*Jour. Wash. Acad. Sci.*, 36 (1946), No. 3, pp. 97-99, illus. 1).—This new nematode—here described—was resuscitated in 1945 from an infested herbarium specimen of a rye leaf collected in 1906; this is believed to be the longest period of dormancy as yet observed for a nematode.

A new hyphomycete parasitic on a species of nematode, C. DRECHSLER. (U. S. D. A.). (*Phytopathology*, 36 (1946), No. 3, pp. 213-217, illus. 1).—In corn meal agar plate cultures planted with small quantities of partly decomposed stems and leaves of *Digitaria sanguinalis* collected from old weed piles in Virginia late in April, numerous specimens of the free-living nematode *Panagrolaimus subclongatus* were found parasitized and killed by a hyphomycete here described as *Acrostalagmus zeosporus* n. sp. Infection came about through germination of adhering conidia. The fungus is manifestly related to the entomogenous species of *Acrostalagmus*, *Beauveria*, and allied genera.

ECONOMIC ZOOLOGY—ENTOMOLOGY

Small mammal censuses near Prairie du Sac, Wisconsin, H. C. HANSON. (Univ. Wis.). (*Wis. Acad. Sci., Arts, and Letters, Trans.*, 36 (1944), pp. 105-129).

Increase of rat infestation on vessels coming to New York, R. OLESEN (*Pests*, 14 (1946), No. 2, p. 32).—A note on the increased incidence as a potential danger to public health.

Carriage of plague by the common brown rat (*Rattus norvegicus*), S. A. BARNETT (*Nature [London]*, 157 (1946), No. 3978, p. 105).—Data from a 1945 outbreak in Malta clearly indicate *R. norvegicus* to be a carrier of plague to man.

Fall migration, edited by M. B. HICKEY (*Audubon Mag.*, 48 (1946), No. 1, Sect. 2, pp. 14, illus. 12).—Notes on the fall (1945) migration of birds are presented by various individuals for the Boston, New York, Philadelphia, Carolina, Pensacola (Fla.), Ohio-Michigan, middle-western, Missouri, Minnesota, Utah, Texas coastal, San Francisco, and southern California regions.

A summary of [Indiana] bird-banding activities from April 1941, to November 1944, J. W. BAECHLE (*Ind. Acad. Sci. Proc.*, 54 (1944), pp. 201-206, illus. 1).

Increasing valley quail in California, J. T. EMLEN, JR., and R. GLADING (*California Sta. Bul.* 695 (1945), pp. 56, illus. 30).—The valley quail (*Lophortyx californica*)—the California State bird—is said to be one of the most popular wild creatures on the farm lands, ranches, and waste areas where it is found. Quail have been driven from some areas formerly inhabited by them and are less common than desirable in many others. Existing knowledge on their management is still far from complete; enough information has been accumulated, however, to warrant publication of this practical guide for ranchers and others interested in building up quail populations. The discussion includes improving the quail habitat, cover, food, and water conditions; protecting against predators, diseases and parasites, accidents, and excessive hunting; and harvesting the quail crop. There are 24 references.

The quail in early Wisconsin, A. W. SCHORGER (*Wis. Acad. Sci., Arts, and Letters, Trans.*, 36 (1944), pp. 77-103 illus. 2).—The author considers the original range of quail in the State, their extension northward, the periods of abundance, the effects of commerce, the decline in populations of quail, their migration, the effects of agriculture, introductions, and weather relations.

La pesca y distribucion de pescado en Puerto Rico [Fishing and distribution of fish in Puerto Rico], M. VELEZ, S. DIAZ PACHICO, and P. B. VAZQUEZ CALCERRADA (*Puerto Rico Univ. Sta. Bul.* 66 (1945), *Span ed.*, pp. 45+, illus. 8; *Eng. abs.*, pp. 39-44).—This is a study of the fishing and marketing activities of 281 fishermen owning boats and gear, 6 wholesalers, 11 fish store operators, 80 peddlers, and 63 grocery stores. The education of fishermen, wholesalers, fish store operators, and of fish peddlers was generally low. With the exception of wholesalers, all the groups studied had been engaged in their respective activities for a considerable number of years. The majority of the fishermen interviewed (88 percent) devoted practically all their working time to fishing activities, only 12 percent receiving additional income. The catch of fish was generally low. Monthly sales of fish per fisherman amounted to only 571 lb. with a value of \$60, and sales of other fishery products to \$2. After deducting expenses, an average net income of \$47 resulted. Of this amount \$24 was retained by the owner of the boat and gear, and the remaining \$23 went as pay to the auxiliary crew of 1.7 men, or \$13 per auxiliary fisherman. Monthly expenses incurred in fishing averaged \$15 per fisherman. Average monthly sales of fish by wholesalers amounted to 5,553 lb. valued at \$793. After deducting the cost of the fish purchased, the resulting gross profit was \$249. Six of the fish stores studied operated profitably while four operated at a loss. Fish stores had a gross margin of 27 ct. per dollar of fish sold, expenses amounting to 22 ct., and a net income of 15 ct. Monthly sales of fish by peddlers averaged 619 lb., with a value of \$100; other fishery products sold amounted to \$3, increasing the total to \$103. Peddlers had a gross income of \$32, expenses of \$6, and a net income of \$26. Peddlers who owned their business received \$28 net income, while those working on a commission basis received only \$18. Only 28 percent of the grocery stores sold fresh fish. The quantity sold ranged from 40 to 500 lb., the average being 170 lb.

The eastern coasts of Puerto Rico proved to be the best fishing area of the island.

Equipment used at present by fish peddlers lacks capacity and attractiveness. The functions of the peddlers in the distribution of fresh fish contribute an essential service; this points to the convenience of improving the equipment used by them, both in capacity and attractiveness. Such an improvement would lead to a larger volume of sales and to a greater demand and patronage.

The lake sturgeon (*Acipenser fulvescens Rafinesque*) in Lake Winnebago, Wisconsin, E. SCHNEBERGER and L. A. WOODBURY (*Wis. Acad. Sci., Arts, and Letters, Trans.*, 36 (1944), pp. 131-140, illus. 1).

Parasites of northern Wisconsin fish, R. V. BANGHAM (*Wis. Acad. Sci., Arts, and Letters, Trans.*; 36 (1944), pp. 291-325).

Protozoology, R. R. KUDO (*Springfield, Ill.: Charles C. Thomas, 1946, 3. ed., pp. 1-336, illus. 336*).—This revision (E. S. R., 82, p. 506) contains numerous alterations and additions, including 69 new figures, more information on protozoa that parasitize man, and new chapters on major groups and phylogeny of protozoa and collection, cultivation, and observation of protozoa.

[Notes on insects and insecticides] (*Jour. Econ. Ent.*, 38 (1945), No. 6, pp. 706-725, illus. 4).—Contributions presented (E. S. R., 94, p. 635) are *Platyptus compositus* Attacking Citrus, by J. T. Creighton (p. 706) (Univ. Fla.); The Alleghany Mound Ant [*Formica exsectoides* Forel] and Its Control, by W. A. Price (p. 706) (Univ. Ky.); Two Squash Root Aphids [*Trifidaphis phaseoli* (Passerini) and *Aphis middletonii* Thos. (det. M. A. Palmer)] (p. 707), *Labops* Damage to Range Grasses (pp. 707-708), and Elateridae Eaten by Utah Birds, all by G. F. Knowlton (p. 707) (Utah Expt. Sta.); Toxicity Tests of Certain N-Substituted 2,4-Dinitroanilines on Codling Moth Larvae, by E. H. Siegler and S. I. Gertler (pp. 708-709), and Improved Dispenser for Testing New Liquefied-Gas Aerosols, by L. D. Goodhue, W. R. Ballinger, and J. H. Fales (pp. 709-710) (both U. S. D. A.); Rate of Penetration of Nicotine Into the [American] Cockroach From Solutions of Various Hydrogen Ion Concentration, by C. H. Richardson (pp. 710-711) (Iowa Sta.); Coincident Infestations of *Aonidiella citrina* and *Coccus hesperidum*, a Result of Ant Activity, by S. E. Flanders (pp. 711-712) (Calif. Citrus Sta.); Chinch Bug Dust Barrier—Preliminary Tests, by R. R. Walton (pp. 713-714) (Okla. Sta.); Hessian Fly Infestation in Tennessee and Kentucky, by L. B. Scott and J. Milam (pp. 712-713), N-Substituted *p*-Toluenesulfonamides to Control Codling Moth Larvae, by E. H. Siegler and S. I. Gertler (p. 715), Ethyl Formate and Isopropyl Formate as Fumigants for Packages of Dried Fruits, by P. Simmons and C. K. Fisher (pp. 715-716), Alpha-Trichloromethyl-Substituted Benzenes to Control Codling Moth Larvae, by E. H. Siegler and E. E. Fleck (pp. 716-717), Ethylene Dibromide as a Fumigant for the Japanese Beetle, by A. C. Mason and R. D. Chisholm (pp. 717-718), and Toxicity of Benzene Hexachloride to Housefly Larvae, by E. R. McGovran and P. G. Piquett (p. 719) (all U. S. D. A.); Bacterial Infections of Potato Tuber Moth Larvae in an Insectary, by E. A. Steinhaus (pp. 718-719) (Calif. Sta.); Distribution of the Sorghum Midge, by E. M. Callan (pp. 719-720); Sabadilla for the Control of the Green Stinkbug, by N. W. Frazier (p. 720) (Univ. Calif.); Artificial Shelters for Measuring Densities of *Anopheles quadrimaculatus*, by S. J. Carpenter (pp. 721-722); *Phyllocoptes gracilis* and the Dry Berry Disease of the Loganberry, by E. P. Breakey (p. 722) (Wash. Sta.); Occurrence of Pacific Coast *Anopheles* in Brackish Water, by W. W. Farrar (p. 722); The Persistence of Toxicity to Codling Moth Larvae of 4,6-Dinitro-o-cresol Applied as a Tree-Trunk Spray, by F. W. Carlson and M. A. Yothers (p. 723), and Three Years of Orchard Tests of 4,6-Dinitro-o-cresol Against Overwintering Codling Moth Larvae, by M. A. Yothers and F. W. Carlson (pp. 723-724) (both U. S. D. A.); DDT Sprays and European Red Mite Populations in Eastern New York, by R. W. Dean (pp. 724-725) (N. Y. State Sta.); and Factors Affecting the Larvicidal Action of DDT on *Culex quinquefasciatus*, by H. S. Hurlbut and R. M. Bohart (p. 725).

The future of entomology, C. T. BRUES (*Amer. Nat.*, 80 (1946), No. 786, pp. 19-21).

Incomplete block experimental designs in insect population problems, F. M. WADLEY. (U. S. D. A.). (*Jour. Econ. Ent.*, 38 (1945), No. 6, pp. 651-654).—It appeared from the preliminary trials reported that insect populations and their activities tend to vary locally, and that there is a chance for some improvement in

precision through use of incomplete block designs. The improvement has thus far been moderate; a gain in efficiency equivalent to that obtained by addition of another replication—in ordinary tests—is suggested as likely. Where crop yield is also a criterion, it may—on variable soil—show more improvement than this. These designs are believed to deserve consideration in insect problems when large numbers of treatments are to be tried in field plots.

Correlations between flight and vision, and particularly between wings and ocelli, in insects, H. KALMUS (*Roy. Ent. Soc. London, Proc., Ser. A*, 20 (1945), No. 7-9, pp. 84-96, illus. 2).—This paper surveys some of the taxonomic, morphological, developmental, hereditary, and physiological relations between flight and wings on the one hand and vision and eyes on the other. "Correlative development of eyes and wings, as mainly demonstrated on ocelli and wings, exists in respect of insect orders, families, genera, species, sexes, phases, castes; it extends even to the body parts of some mosaics. Mutant genes affecting both eye and wing characters are known in *Drosophila*, but gene segregation cannot account for the distribution in polymorphic populations. Eye and wing development is probably controlled hormonally by the corpus allatum, and their suppression may be part of a neotenic development, affecting other organs at the same time. In bringing about this widely distributed eye-wing relationship natural selection appears to have acted in many ways and on greatly differing levels of development and organization. Thus the same end is achieved by very different means. The selective advantage of ocelli to flying insects probably consists in the production of muscular tonus by these organs and possibly in orientating the flying insect with its back to the sky." There are 35 references.

Mode of entry of contact insecticides, N. E. HICKIN (*Nature [London]*, 156 (1945), No. 3973, pp. 753-754).—In experiments with various types of animal lice, contact between the insecticide used and the insects was almost entirely through the medium of the tarsi.

Leaf area and its relation to application of insecticides, W. W. STANLEY. (Tenn. Expt. Sta.). (*Jour. Econ. Ent.*, 38 (1945), No. 6, pp. 703-705, illus. 1).—Measurements of the rapid increase in leaf area of growing bunch beans and burley tobacco indicated that the beans grew at an average daily rate of 12.67 percent and tobacco at 6.77 percent. The bean plants averaged a maximum of 3,058 sq. cm. (3.30 sq. ft.) per plant and the tobacco 21,072 sq. cm. (22.68 sq. ft.), but on an acre basis the total leaf area was about the same—slightly over 5 acres—for each crop. Most instructions on how to apply insecticides to plants give statements in terms of pounds of insecticide per acre of land. Since the information obtained shows that the area of the leaves to be treated may be 5 to 10 times more than the ground acreage, the instructions should consider also the stage of development of the plants—the plant-surface area per acre of ground. Median lethal dose studies show that for effective results an insecticide in field use must be applied in doses approaching those used in laboratories.

The evaluation of liquefied-gas aerosol formulations, L. D. GOODHUE (*Soap and Sanit. Chem.*, 22 (1946), No. 2, pp. 133, 135, 165).

Preliminary investigations on heat-generated aerosols for the control of agricultural pests, R. LATTA. (U. S. D. A.). (*Jour. Econ. Ent.*, 38 (1945), No. 6, pp. 668-670).—Since gases of the Freon or methyl chloride type are too expensive for covering large areas, studies of the "heat-generated" aerosols were undertaken; the present method of applying them is to mount a generator on a truck and move slowly across the direction of the wind so that the aerosol will drift over the area to be treated from a front approximately at right angles to the wind drift. In this way it is possible to treat up to several hundred acres in part of a day. With the present generators, aerosols can be produced which contain up to 16 percent or more

of DDT in the original mixture, at intake rates of 20 to 100 gal. per hour per generator. This preliminary report is presented to serve as a background in the further study of applying aerosols to the control of agricultural pests.

Dispersion of DDT sprays from fast combat aircraft, H. A. JONES, A. W. LINDQUIST, C. C. DEONIER, and C. N. HUSMAN. (U. S. D. A.). (*Jour. Econ. Ent.*, 38 (1945), No. 6, pp. 691-693).—Good control of captive houseflies and anopheline mosquito larvae was obtained in preliminary tests by releasing DDT solutions from Chemical Warfare Service M-10 tanks attached to fast combat planes, effective swaths under favorable conditions ranging from 150 to 400 yd. A plane flying across the wind and releasing a 27.5-gal. tank of 5 percent DDT in these tests would have resulted in good control of insects over an area of about 30 acres, assuming a 200-yd. effective swath and a linear coverage of 700 to 800 yd. Better control of test insects was obtained with a 10 percent than with a 5 percent solution of DDT; it would seem desirable to use this higher concentration to compensate for the uneven character of the deposit obtained, even though this may result in some overdosing. Applied at the dosage used, DDT may have injurious effects on fish, birds, frogs, and other wildlife; such factors, however, would be of minimum importance in military operations. These tests were the first to demonstrate the feasibility of controlling insects by release of DDT from fast combat aircraft. They stimulated further investigations in this field and served to fill the need until more efficient equipment had been designed.

DDT penetration prevented by adding aluminum stearate to DDT-kerosene solutions, W. EBELING. (Calif. Citrus Expt. Sta.). (*Jour. Econ. Ent.*, 38 (1945), No. 6, pp. 689-691, illus. 1).—These experiments were initiated to determine whether the DDT dissolved in kerosene might not be more efficiently deposited on the tree surface if the kerosene were prevented from penetrating, thus evaporating and leaving the DDT crystals on the surface. In one typical test three to four times as much DDT was retained on the surfaces of absorptive substrates when 4 percent DDT-kerosene solutions containing 2 percent aluminum stearate were applied than when the same solutions not containing the stearate were employed. Use of mutual solvents to increase the amount of DDT that may be added to the oil solution affected the manner of deposition of DDT on the surface; for example, Tetralin and Velsicol AR-60 in 10 percent solutions in kerosene had a considerable effect themselves in retarding penetration of the kerosene, but this action was small compared to that of 1 percent aluminum stearate. Further detailed results are given.

First progress report of cooperative research project on DDT between Canadian Pest Control Operators Association and Division of Entomology, Canadian Department of Agriculture, E. R. BELLEMERE ET AL. (*Pests*, 14 (1946), No. 1, pp. 11-12).—A brief report on results with some eight groups of insect pests.

A new chlorinated hydrocarbon insecticide, C. W. KEARNS, L. INGLE, and R. L. METCALF. (Univ. Ill. et al.). (*Jour. Econ. Ent.*, 38 (1945), No. 6, pp. 661-668).—A chlorinated hydrocarbon (empirical formula $C_{10}H_6Cl_8$ designated "1068") was found to be more toxic than DDT and to compare favorably in toxicity to the γ isomer of benzenhexachloride to a number of insect species; it is possibly a mixture of isomers not as yet resolved and evaluated individually. It was the purpose of this preliminary paper to report laboratory tests by standard entomological procedures on several species of insects which will serve to indicate a few of the possible fields of usefulness for 1068. These trials were made on aphids, the Colorado potato beetle, squash bug, anopheline mosquitoes (including residual toxicity and larvicidal tests), the American cockroach, and the differential grasshopper (as a stomach poison to the adults); detailed results are presented.

Insect-repellent properties of 2-ethylhexanediol-1,3, P. GRANETT and H. L. HAYNES. (N. J. Expt. Stas.). (*Jour. Econ. Ent.*, 38 (1945), No. 6, pp. 671-675).—

Extensive field and laboratory trials of this material—known during the war as Insect Repellent No. 612—indicated it to possess highly effective repellent properties against a variety of arthropod pests. Equally extensive toxicological studies and large-scale use by the military forces have proved its safety and lack of irritant properties. Finally its physical and chemical properties are such as to make it easy and pleasant to apply and stable in storage or use. This brief paper considers its physical, chemical, and repellent properties; its use in protecting against mosquitoes, including the effect of varying the amount employed; application to clothing; arthropod pests other than mosquitoes (stablefly, blackfly, sand flies, fleas, chiggers, bedbugs); and its toxicological properties.

Insecticidal properties of Euphorbia extracts, F. L. VANDERPLANK (*Nature [London]*, 156 (1945), No. 3974, p. 782).—Preliminary experiments indicated extracts of *E. tirucalli* to possess insecticidal properties. African tribes are reported to use this species and *E. calycina* as insecticides.

New German insecticides, L. B. KILGORE (*Soap and Sanit. Chem.*, 21 (1945), No. 12, pp. 138–139, 169, 171; 22 (1946), No. 2, pp. 122–124).—This "resume of new synthetic chemicals and insect repellents developed in Germany has been compiled from the reports of specialists sent to Germany at the request of the Joint Chiefs of Staff and now released by declassification. . . ."

Compatibility of cryolite and copper fungicides, G. WENE and W. A. RAWLINS. (Cornell Univ.). (*Jour. Econ. Ent.*, 38 (1945), No. 6, pp. 655–657).—Combining a number of commercial fixed Cu compounds with natural cryolite (Kryocide) failed to affect adversely the toxicity of the latter to third- and fourth-instar Mexican bean beetle larvae. Bordeaux delayed and decreased the toxic action but did not render the cryolite impotent. Considerably more feeding was observed on bean leaves sprayed with cryolite-bordeaux than with the cryolite-fixed copper combinations. The evidence thus suggests a change in the cryolite when combined with bordeaux—a change not evident in the fixed Cu mixtures. In a single field test against the Colorado potato beetle, bordeaux delayed the toxic action of the cryolite, but did not materially reduce the final mortality in comparison with kills obtained by two fixed Cu combinations.

The distribution and relative seasonal abundance of the Indiana species of Cordulidae and Libellulidae (Odonata), B. E. MONTGOMERY. (Purdue Univ.). (*Ind. Acad. Sci. Proc.*, 54 (1944), pp. 217–224, illus. 2).—A summary of the Indiana records for members of these two families.

Note préliminaire sur les récentes pullulations d'acridiens, du criquet migrateur (*Locusta migratoria*) en particulier [Preliminary note on the recent swarms of acridians and of the migratory locust in particular], P. VAYSSIÈRE (*Compt. Rend. Acad. Sci. [Paris]*, 221 (1945), No. 2, pp. 62–64).

A new genus and species of locust of the group Euthymiae (Orthoptera: Acrididae: Cyrtacanthacridinae) from South Africa, J. A. G. REHN (*Phil. Acad. Nat. Sci., Notulae Naturae*, No. 155 (1945), pp. 7, illus. 7).—*Karrua paradoxa* n. gen. and sp. is described.

A first list of Indiana stoneflies (Plecoptera), W. E. RICKER (*Ind. Acad. Sci. Proc.*, 54 (1944), pp. 225–230).

Two species of *Colias* migrating in central U. S. A. (Lep.: Rhopalocera), K. J. FISHER (*Roy. Ent. Soc. London, Proc., Ser. A*, 20 (1945), No. 10–12, pp. 107–109, illus. 4).—Refers to butterflies of the alfa caterpillar and the clouded sulphur.

The position of *Epione mollicularia* (Lep.: Geometridae), W. T. M. FORBES. (Cornell Univ.). (*Ent. News*, 56 (1945), No. 10, pp. 272–276, illus. 1).—Descriptive and taxonomic notes on this geometrid moth.

The effects of rotenone-bearing dusts on the diamond-back moth (*Plutella maculipennis* Curt.), W. COTTIER and H. JACKS (*New Zeal. Jour. Sci. and Technol.*,

27 (1945), No. 3, Sect. A, pp. 244-249).—"Experiments were carried out to determine whether percentage rotenone or ether extract content would indicate insecticidal value of rotenone-bearing dusts against diamondback moth. Dusts were made up from four powdered roots imported from overseas manufacturers; three were derris root and one cube. When each of these was diluted with filler to give 0.25 percent, 0.5 percent, 0.75 percent, and 1.0 percent, rotenone-increasing concentration gave improved performance for dusts made up from the same powdered root. When, however, dusts of the same rotenone content but made up from different powdered roots were compared, considerable differences in performance occurred. Nor could these differences be explained by percentage ether extract content. Twenty-five lb. of a dust containing a certain percentage of rotenone gave better results than 50 lb. of one containing half that percentage of rotenone."

A seedling method for testing aphid resistance and its application to breeding and inheritance studies in cucurbits and other plants, S. S. IVANOFF. (Tex. Expt. Sta.). (*Jour. Hered.*, 36 (1945), No. 12, pp. 357-361, illus. 2).—A practical method is described for testing resistance to aphids (melon aphid used) in cucurbits by artificial infestation in the seedling stage. The advantages of the technic over the field method—which depends on spontaneous infestation—are speed, economy, high accuracy, dependability, and simplicity. The procedure is also useful for isolating lines resistant to downy mildew (*Peronoplasmopara cubensis*) in certain cantaloups where aphid resistance is closely associated genetically with resistance to this disease. The method is applicable to cotton and okra and may also be adaptable to other plant species.

Monograph of the family Mordellidae (Coleoptera) of North America, north of Mexico, E. LILJEBLAD (*Mich. Univ. Mus. Zool. Misc. Pub.* 62 (1945), pp. 229, illus. 125).

Modification of the geraniol and eugenol content of Japanese beetle bait, M. H. MUMA, G. S. LANGFORD, and E. N. CORY (*Jour. Econ. Ent.*, 38 (1945), No. 6, pp. 658-660).—Studies directed toward modification of the present Japanese beetle bait formula in the interest of conserving or replacing the current limited and costly supplies of eugenol and geraniol—particularly the latter—indicated that this may be accomplished in three ways: (1) The present bait—composed of geraniol and eugenol—may be diluted 50 percent with equal parts of Deobase oil and light white mineral oil; this did not materially affect the attractive qualities of the bait. (2) The present 10 : 1 ratio of geraniol and eugenol may be shifted to a 1 : 1 mixture which may be diluted 30 percent with mineral oils without causing reduction in attractive value. (3) Substitute materials may be used to replace all or nearly all of the geraniol in the mixture; of those tested, caproic acid and anethol proved quite effective, with citral somewhat less desirable. Two esters, viz, ethyl caproate and phenyl ethyl butyrate, showed possibilities and may prove effective.

The synergistic action of *N,N*-diethylpiperonylamide with pyrethrum marc in control of the Mexican bean beetle, C. A. WEIGEL and S. I. GERTLER. (U. S. D. A.). (*Jour. Econ. Ent.*, 38 (1945), No. 6, pp. 683-686).—The tests reported show *N,N*-diethylpiperonylamide to be a synergist for pyrethrum marc when used against the Mexican bean beetle; it appears to act as a paralytic agent rather than a stomach poison. Since the affected insects drop to the ground, any factor such as extreme heat or direct sun would tend to kill them more readily. Further tests should be made on a large scale not only against this pest but also against other insects that may be controlled with pyrethrum.

Disodium ethylene bisdithiocarbamate for control of Mexican bean beetle, D. O. WOLFENBARGER and J. W. HEUBERGER. (Del. Expt. Sta.). (*Jour. Econ. Ent.*, 38 (1945), No. 6, pp. 675-678, illus. 3).—Disodium ethylene bisdithiocarbamate (Dithane) applied to the soil around bean plants and as a foliage spray was found

to control the Mexican bean beetle. Dosages of 100 and 400 lb. applied as soil treatments effectively reduced the infestations but lowered the yields as well. Further work should be performed before Dithane can be recommended for this purpose.

Influence of food plants on fecundity, larval development, and abundance of the tuber flea beetle in Nebraska. R. E. HILL (*Nebraska Sta. Res. Bul.* 143 (1946), pp. 16, illus. 2).—All food plants tested were those on which overwintered *Epitrix tuberis* Gent. commonly fed in spring. The type of plant consumed by caged beetles markedly influenced oviposition and length of adult life. Egg production was highest and mortality lowest on potato foliage; on the same basis, tomato and wild tomato (*Solanum triflorum*) also proved favorable adult foods, but buffalo bur (*S. rostratum*)—although equally adequate for adult subsistence—proved inferior for egg production. Measured in terms of both oviposition and longevity, prairie ground cherry (*Physalis lanceolata*), field beans, marsh elder (*Iva xanthifolia*), and *Kochia scoparia* were less satisfactory. Substitution of potato foliage for less nutritious diets was followed by increased egg production; change from potato to foliage of other food plants, by decreased egg production. In one 60-day test significant fluctuations in egg deposition were recorded when—at 10-day intervals—diets of potato foliage were alternated with either marsh elder or buffalo bur. In the field, larvae developed most readily and in largest numbers on potato roots and tubers; considerably less development occurred on roots of tomato, and relatively few individuals matured on ground cherry, black nightshade (*S. nigrum*), buffalo bur, and bean. No larval development was recorded from wild tomato, marsh elder, and kochia. Egg viability was unaffected by type of food, but there was some indication that the frequency of copulation was influenced by the quality consumed.

The findings indicated that elimination of all early plantings of potatoes would lower the general population level by reducing the reproductive capacity and longevity of the overwintered beetles. Without potatoes the overwintered insects would be forced to feed, live, and reproduce on less nutritious hosts, thus greatly decreasing the numbers of the first generation available to infest late-planted potatoes. Since western Nebraska is essentially a late-potato area, elimination of the relatively few early-planted acres would be practical and should involve only minor adjustments in the general farming program of a few individual growers. There are 24 references.

Crop rotations and cultural practices as related to wireworm control in Idaho. F. H. SHIRCK. (U. S. D. A. coop. Idaho Expt. Sta.). (*Jour. Econ. Ent.*, 38 (1945), No. 6, pp. 627–633, illus. 3).—Under normal conditions changes in wireworm population were found to be gradual from year to year, but excessive increases occurred in red clover fields. High populations in alfalfa decreased from year to year, and the decrease was accelerated by soil dryness in fields where the alfalfa was allowed to go an entire season without irrigation. A survey of 52 fields showed that, in general, wireworm populations increased in the first crop following alfalfa; this increase was mathematically significant for potatoes and corn. There was no significant population change in sugar beets grown for 2 yr. following alfalfa. The increase of adults in crops following alfalfa was more rapid than the general increase of wireworm populations. A relatively long crop rotation—with the land in alfalfa at least half the time—appears to offer the best opportunity for cultural control of wireworms.

Ethylene dibromide and dichloropropane-dichloropropene mixture for wireworm control. W. H. LANGE, JR. (Calif. Expt. Sta.). (*Jour. Econ. Ent.*, 38 (1945), No. 6, pp. 643–645).—The comparative tests of D-D mixture and ethylene dibromide at three California stations (1944–45) indicated these fumigants to offer

good possibilities for economical control of wireworms when applied in continuous streams at depths of 6 to 8 in. and 12- to 15-in. spacings. With D-D mixture, 40 gal. (400 lb.) per acre gave satisfactory control and increased the yields of lettuce and beans. The simultaneous applications of 35 lb. of anhydrous ammonia with 40 gal. of D-D mixture in the fall gave the greatest increases in yields of lettuce the following spring. Ethylene dibromide at both 30 and 40 gal. of 10 percent strength by volume in a naphtha-200 thinner per acre gave good kills of wireworms and increased both stands and yields. This dosage compared in most cases with 40 to 60 gal. of D-D mixture from the standpoint of actual kill of wireworms, though the increased yields from treatment may depend on what crop is to be planted, as well as on other factors such as the time interval between fumigation and planting date.

The use of lead arsenate as a control for the grass-grub *Odontria zealandica* White. W. COTTIER (*New Zeal. Jour. Sci. and Technol.*, 27 (1945), No. 3, Sect. A, pp. 239-243).—A significant reduction in the grub population was observed at 18 weeks after applications of 10 and 20 lb. of lead arsenate per 1,000 sq. ft. of turf; after 24 weeks, dosages of 2.5 and 5 lb. also became effective. Turf treated in April at 2.5, 5, and 10 lb. per 1,000 sq. ft. was protected from reinfestation the following season. A vigorously growing turf could be treated with up to 10 lb. per 1,000 sq. ft. without permanent injury; on less vigorous turf it sometimes caused serious damage, though 5 lb. did not. A top dressing of sulfate of ammonia at 2 cwt. per acre assisted grass to recover from the yellowing caused by the arsenate. Preliminary (10 mo.) tests showed that nitrate of soda and sulfate of ammonia at 0.5, 1, and 2 cwt. per acre and superphosphate at 2, 3, and 4 cwt. did not impair the efficiency of the lead arsenate. Observations indicated that application of lead arsenate at 2 lb. per 100 sq. ft. to strips of ground 6 in. wide and 2 to 3 in. deep—in which rows of strawberries were later planted—appeared to prevent reinfestation for at least three seasons and caused no injury to the plants.

***Aplomya caesar* (Aldrich), a tachinid parasite of the European corn borer.** G. WISHART (*Canad. Ent.*, 77 (1945), No. 9, pp. 157-167, illus. 14).—*A. caesar* is said to be the most abundant native parasite of the European corn borer, laying its eggs on cut or fed-upon surfaces of the host food. Its various life history stages are described. The parasite has as many generations per year as the borer, which means that in Ontario it is usually single brooded; it winters as a first-stage larva in the head of the host. Adults mate well and oviposit freely in laboratory cages, the ♀ producing about 1,000 eggs. The egg is eaten by the host, hatches in the digestive tract, and the larva bores through to the body cavity, finally taking a position in the head. After hibernation the larva moves forward and with its buccal armature cuts a respiratory opening at an antennal sclerite; a respiratory funnel is formed at this point. After hibernation is over, 6 to 8 days are required until the puparium is formed and a further 8 days to the emergence of the adult fly. The distribution and other hosts of the parasite are given.

Corn rootworms. H. D. TATE and O. S. BARE (*Nebraska Sta. Bul.* 381 (1946), pp. 12, illus. 7).—Corn rootworms are reported to be major pests of corn in Nebraska and to have become more and more menacing in recent years due to the favorable rainfall, an increase in irrigation, and the spread of the Colorado corn rootworm into commercial corn-growing areas. The northern and southern species are also common in the State, though the last is much less important than the other two. Information is presented on the history of the Colorado and northern corn rootworms, their local distribution, host plants, type of injury, economic importance, appearance, seasonal history, conditions favoring their abundance, and control; the southern species is discussed in less detail.

The pea weevil and methods for its control. T. A. BRINDLEY, J. C. CHAMBERLIN, F. G. HINMAN, and K. W. GRAY. (Coop. Idaho, Oreg., and Wash. Expt. Stas.).

(U. S. Dept. Agr., *Farmers' Bul.* 1971 (1946), pp. 24+, illus. 14) —The pea weevil is one of the most important insect pests attacking all varieties of edible and field peas in the United States; it does not attack other legumes. This publication presents information on the principal sources of infestation and on its life history, habits, natural enemies, and control.

Field trials of insecticides for the control of the sugar-cane froghopper, A. PICKLES (*Trop. Agr.* [Trinidad], 23 (1946), No. 1, pp. 9-11, illus. 8).—It is believed on the basis of these tests that DDT and sabadilla show promise for froghopper control via drift dusting; the residual effect of DDT is likely to make it a most valuable ingredient of insecticidal mixtures for this purpose.

Experiments with insecticides to control the strawberry weevil in North Carolina and Maryland, W. A. THOMAS. (U. S. D. A.). (*Jour. Econ. Ent.*, 38 (1945), No. 6, pp. 678-682).—The best results were obtained with arsenical and fluorine compounds, but none of them proved very satisfactory; control of relatively light infestations did not result in appreciable increases in yield. The strawberry plants produced a large percentage of surplus buds that failed to make marketable berries. Apparently a small amount of pruning by the weevil did not adversely affect the yield. Derris, sulfur, and pyrethrum were less effective than were calcium arsenate and cryolite. Nicotine bentonite was not satisfactory.

The insects of the cultivated blueberry, C. S. BUCKWITH. (N. J. Expt. Stas.). (*N. J. Dept. Agr. Cir.* 356 (1945), pp. 43-51).

Mortality of the Mexican fruitfly in mangoes treated by the vapor-heat process, J. W. BALOCK and D. F. STARR. (U. S. D. A.). (*Jour. Econ. Ent.*, 38 (1945), No. 6, pp. 646-651, illus. 3).—The vapor-heat tests were conducted in a conditioning cabinet equipped with a turntable of 16-tray capacity, designed to permit removal of random lots of fruit during treatment. The data submitted covered 23 tests with 25,300 mangoes and an estimated population of 205,343 larvae. Treatment periods were 8 to 13 hr., the first 8 hr. of which represented the approach period needed to reach temperature equilibrium at 110° F. Regression lines calculated by the method of probits from these data gave an exposure security at probit 9 (99.9968 percent kill) of 5.7 hr. based on the number of survivors attaining the pupal stage and 3.9 hr. based on the number attaining the adult stage. These periods were in addition to the 8 hr. used in the approach. The experiments were designed so that errors due to differences in position in the vapor-heat cabinet might be studied. The data were subjected to analysis of variance, and the error due to position was found not to be significant.

The bronzed birch borer problem in Maine, H. B. PEIRSON and A. D. NUTTING (*Maine Forest Serv. Cir.* 6 (1945), pp. 10, illus. 4).—An informatory circular on this pest. Attention is called to the thousands of cords of birch allowed to fall over and rot during the past few years. It is recommended that a close watch on birch be kept and that infested or mature stands be cut while they are still usable. Young stands should be allowed to grow for future use.

Southern pine bark beetles, D. A. ANDERSON (*Tex. Forest Serv. Bul.* 33 [n. d.], pp. 8, illus. 9).—An informatory leaflet.

The southern pine sawyer, D. A. ANDERSON (*Tex. Forest Serv. Bul.* 34 [n. d.], pp. 4, illus. 4).—An informatory leaflet.

Pine tip moth [*Rhyacionia frustrana*], D. A. ANDERSON (*Tex. Forest Serv. Bul.* 35 [n. d.], pp. 4, illus. 4).—An informatory leaflet.

Food preferences of the cockroach *Blatta orientalis* Linn., P. RAU (*Ent. News*, 56 (1945), No. 10, pp. 276-278).—From results with seven baited traps it is concluded that starchy foods are practically the only choice of the oriental cockroach. In a further test it was evident that re-used odorous traps would give the same results in testing food preferences as did the new traps.

Concentration-survival time relationship for roaches injected with arsenicals, S. C. MUNSON and J. F. YEAGER. (U. S. D. A.). (*Jour. Econ. Ent.*, 38 (1945), No. 6, pp. 634-642, illus. 3).—When injected into American cockroaches, sodium monohydrogen orthoarsenate and sodium metarsenite yielded hyperbolic concentration-survival time curves characterized by a region of inflection and a critical zone. Lead arsenate yielded a curve showing no inflection but having a critical zone. Sodium arsenate and sodium metarsenite were equally toxic except in the higher molar concentrations, where the arsenite was the more toxic; lead arsenate was less toxic than either. These findings are given a rational explanation on the basis of a dissociation hypothesis previously noted (E. S. R., 94, p. 793), according to which in these experiments the arsenical ions formed by the sodium metarsenite and the sodium arsenate (and probably by lead arsenate) are equally toxic and their differences in toxicity due largely if not entirely to the differences in their dissociation. Survival times agreeing well with the observed times were calculated with equations based on this dissociation hypothesis. Methods are suggested for estimating the blood volume of an insect and for comparing toxicity symptoms caused by different poisons. Evidence is presented that the yellow mealworm is more resistant than the American cockroach to poisoning by sodium metarsenite as applied in the tests here reported.

Applied entomology in the cereal industries, B. N. SMALLMAN (*Wallerstein Labs. Commun.*, 8 (1945), No. 25, pp. 156-168, illus. 5).—This paper reviews recent important advances in applied entomology for the brewing industry and presents illustrations—some of them in color—of several of the worst pests.

A monograph of the beetles associated with stored products, I. H. E. HINTON (*London: Brit. Mus. (Nat. Hist.)*, 1945, vol. 1, pp. 443+, illus. 505).—The preface by N. D. Riley states that "most of the beetles with which this work is concerned are small or very small. Their accurate identification is often a matter of difficulty even to the experienced entomologist. It is therefore not surprising that much confusion reigns in the literature on stored product beetles, and that the few works that profess to facilitate identification sometimes achieve only the opposite result. About one-third of the beetles known to be associated with stored products are described in the present volume, but it is hoped that the identification of these has now been placed on a thoroughly secure basis. The author has supplemented his descriptions of the species and their immature stages by summarizing the published information on their biology and in some cases by adding to it from personal observations. References are given to papers on control measures, but no attempt has been made to discuss them." A subject index and over 26 pages of references—listed alphabetically by authors—are included.

Use of DDT as an insect control in the canning industry, F. C. BISHOPP. (U. S. D. A.). (*Canner*, 102 (1946), No. 10, pp. 13-14, 18).—This account is from an address summarizing the current status of DDT, including control of insects in packing plants and present recommendations for its use, with a brief note on benzene hexachloride ("666").

Preliminary report on the use of DDT as an insecticide in the fishery industries, L. A. SANDHOLZER and A. W. LINDQUIST. (U. S. D. A. et al.). (*Pests*, 14 (1946), No. 1, pp. 22, 24, 26).

The action on certain insects of fabrics impregnated with D. D. T., H. HAYHURST (*Jour. Soc. Chem. Indus., Trans. and Commun.*, 64 (1945), No. 10, p. 296).—The results of this investigation showed that insect infestation can be controlled by use of sacks impregnated with DDT. The tests were made on the rice weevil, confused flour beetle, and *Plinus tectus* Bo.

Summary of DDT experiments on insects that affect man and animals, W. E. DOVE. (U. S. D. A.). (*Pests*, 14 (1946), No. 2, pp. 8-12, 14).

Toxicity of DDT for laboratory and domestic animals, P. J. G. PRITCHARD (*Pests*, 14 (1946), No. 2, p. 28).—A brief note on the results of toxicological studies.

Biological notes on *Chrysopa dorsalis* Burm. (Neuroptera), F. C. FRANKER (*Roy. Ent. Soc. London, Proc., Ser. A*, 20 (1945), No. 10-12, pp. 116-121, illus. — Notes on the life history and habits of this deer fly.

[Brief contributions on mosquito and malaria control] (*Mosquito News* 5 (1945), No. 4, pp. 121-152, illus. 45).—The following are included: *Anopheles* and Malaria in the Northwestern States, by C. M. Gjullin and W. W. Yates (pp. 121-127) (U. S. D. A.); Some Inter-county Mosquito Control Operations Showing Equipment Used in Improvement of the Upper Passaic River Channel in Essex and Morris Counties, New Jersey, by R. L. Vannote and G. W. Eager (pp. 128-131); The Occurrence of *Orthopodomyia alba* Baker at New Orleans, Louisiana, by P. H. Harden (p. 131); Labor Vs. Mechanized Equipment in Mosquito Control Work—Shifting Emphasis in Alameda County (California) Mosquito Abatement District, by H. F. Gray (pp. 132-134); Notes on Mosquito Migration in Salt Lake City in 1945, by D. M. Rees (p. 134); Equipment Developed by Delaware State Highway Department for Mosquito Control Work, by E. E. Lynch (p. 135); Some Mosquito Control Operations in Bergen County, New Jersey, by V. Conani (pp. 136-137); Mobile Dredge Pump for Mosquito Control, by J. V. Osmun (pp. 138-139); The Disk Harrow—a Valuable Addition to Malaria Control Equipment, by W. J. Perry (pp. 140-141); Some Mosquito Control Operations in Monmouth County, New Jersey, by H. G. Vannote (pp. 142-143); DDT Emulsion for the Control of Culicine Mosquitoes in Cisterns, by R. P. Holdsworth, Jr., C. C. Deonier, and Z. D. Harrison (pp. 144-145) (U. S. D. A.); The Finding of *Anopheles albimanus* Wied. at West Palm Beach, Florida (Diptera: Culicidae), by E. V. Welch (p. 145); A Pump Installation to Drain a 300-Acre Salt Marsh, by O. W. Lafferty (pp. 146-147); and Mosquito Control in Suffolk County, New York, by C. T. Williamson (pp. 148-152).

Occurrence of malaria mosquitoes in southern Michigan, C. W. SABROSKY (*Michigan Sta. Tech. Bul.* 202 (1946), pp. 50, illus. 2).—In pioneer days, Michigan was regarded as highly malarial; in the recent past the average has been about 70 scattered cases per year. Four species of *Anopheles* are known to occur in the State, viz, the common malaria mosquito, and *A. punctipennis*, *A. walkeri*, and *A. maculipennis*; the last is a northern species, and this 1943 survey recorded only a few adults. In all, 660 stations were sampled (624 of them for larvae) and anophelines were observed to be common, abundant, and widely distributed; either larvae or adults of malaria mosquitoes were found in over 69 percent of these locations. Of the 624 breeding places sampled for larvae, anophelines were found in 419; the total field count averaged over 17 per positive station. The principal species in the southern part of the State is the common malaria mosquito—the chief vector for eastern North America; of the 4,907 identified larvae and pupae, 75 percent were this species. It was found breeding in a great variety of situations; the averages for standing-water types of breeding sites were somewhat higher than for running waters, though the latter habitats were surprisingly productive. *A. punctipennis* was second in importance, and showed a greater preference for running waters. *A. walkeri* appeared to be a minor factor in the anopheline fauna but—since its larvae may be scattered singly here and there over a large area of marsh or swamp—the samples probably failed to give a true picture of its abundance. On a number of occasions, two or rarely three species were found breeding at the same station; this has considerable significance in relation to control programs. The roles of various types of breeding places and of different areas of the State in the production of anophelines are discussed in some detail, and recommended control measures and suggestions are presented. Keys to the adults, larvae, and

pupae and a brief summary of the literature (12 references) on Michigan anophelines as malaria vectors are included.

Contribuição para o estudo dos vetores de malaria no Brasil—*Anopheles (Nyssorhynchus) darlingi* Root, em Campos, no Estado do Rio [Malaria vectors in F. . .], J. O. COUTINHO and VAN RICCIARDI (*Mem. Inst. Oswaldo Cruz*, 42 (1945), No. 1, pp. 263-280; *Eng. abs.*, p. 278).—The author reports the occurrence outdoors in Campos City, Rio de Janeiro State, of *A. albitarsis*, *A. darlingi*, *A. triannulatus*, *A. oswaldoi*, *A. noroestensis*, *A. pessoai*, and *A. intermedius*—the first three also indoors; the first two were shown to be malaria vectors. Data are also presented on the breeding places; *A. darlingi* was found to breed in large bodies of water as well as in small pools and drainage ditches under the open sky. A review of the literature (17 references) on *A. darlingi* as a vector and on the ecology of its larvae is included.

Comparisons of mating behavior, growth rate, and factors influencing egg-hatching in South American *Haemagogus* mosquitoes, W. HOVANITZ (*Physiol. Zool.*, 19 (1946), No. 1, pp. 35-53, illus. 5).—Laboratory observations on the mating behavior, egg hatching, and developmental rate of the yellow fever mosquito and of seven species of *Haemagogus* are described. Comparisons are also made with similar data on *Anopheles* and *Culex*. The type and frequency of egg hatching in *Haemagogus* indicated a quality imposed through the ♀ which may be hereditary or environal. Seasonal or environal influences on the ♀ seemed to alter the hatching of the eggs; genetic selection of strains within the species for egg-hatching differences also appears highly possible. There was apparently no correlation between the number of eggs laid and the frequency of eggs which hatch in the progeny. A distinction is drawn between two phenomena which must be considered in these problems: One covers the factors influencing the capacity of eggs to hatch under the influence of a stimulus; the other covers the physiological mechanism by which eggs are enabled to remain in the quiescent stage. The normal hatching phenomena are discussed, followed by the ways in which a breeder can take advantage of them for increasing generation turn-over and number.

A transmissão de *Plasmodium gallinaceum* pelo *Aedes (Ochlerotatus) lepidus*, W. L. PARAENSE (*Mem. Inst. Oswaldo Cruz*, 42 (1945), No. 1, pp. 81-84; *Eng. abs.*, p. 83).—This mosquito is reported to be a good vector of *P. gallinaceum*, transmitting this malarial infection to chicks of various ages.

Four new species of mosquitoes from Okinawa (Diptera: Culicidae), R. M. BOHART and R. L. INGRAM (*Jour. Wash. Acad. Sci.*, 36 (1946), No. 2, pp. 46-52, illus. 24).—Two new species of *Aedes* and one each of *Anopheles* and *Uranotaenia* are described.

Airplane spraying of rice fields with DDT to kill mosquito larvae, C. B. WISECUP, W. C. BROTHERS, and P. M. EIDE. (U. S. D. A.). (*Jour. Econ. Ent.*, 38 (1945), No. 6, pp. 686-688).—In these tests, a water emulsion of 5 or 10 percent DDT was prepared from a concentrate containing 25 percent DDT, 68 percent xylene, and 7 percent Triton X-100; applications were via liaison-type airplanes to more than 700 acres of growing rice in Arkansas. The emulsion was sprayed satisfactorily from the planes. *Anopheles* larvae were readily killed by 0.1 to 0.2 lb. DDT per acre, but preflooding treatments at these dosages were of doubtful value against the larvae; larvae of *Psorophora* spp. were killed by direct applications, and similar light dosages gave good control when applied before the fields were flooded. Dosages greater than 0.5 lb. DDT per acre tended to control all mosquito larvae for about a month. No damage to rice was observed. Liaison-type airplanes of Army designations L-2, L-3, and L-4 proved equally satisfactory for spraying. No special training was needed for service pilots to make these applications in open country.

The Physaloptera (Nematoda) of carnivores, B. B. MORGAN. (Univ. Wisc.). (*Wis. Acad. Sci., Arts, and Letters, Trans.*, 36 (1944), pp. 375-388, illus. 14).—Includes an annotated list.

The tail mite and its control, F. L. JOYCE (*Amer. Fur Breeder* 10 (1946), No. 8, pp. 22-27).—On promising results against the tail mite on minks by use of a dip made up with Hy-Kresol, said to be on the market as a general purpose disinfectant.

Os tricodectideos dos roedores (Mallophaga) [Bird lice of the order Trichodectidae on rodents], F. L. WERNECK (*Mem. Inst. Oswaldo Cruz*, 42 (1945), No. 1, pp. 85-150, illus. 68).—Members of the genera *Gcomydoecus* and *Eutrichophilus*—including new species—are described and discussed. Many of the species are illustrated.

DDT as a chicken louse control, H. S. TELFORD (*Jour. Econ. Ent.*, 38 (1945), No. 6, pp. 700-703).—When 1 gm. DDT was administered orally to each of 4 louse-infested birds averaging in weight 2,333 gm. each, no significant reduction of body or shaft lice resulted. Dipping birds grossly infested with these lice in a 0.03-percent emulsion gave almost complete control within 4 hr. and full control within 2 days. These birds were then placed with an infested flock of 100; on the forty-fourth day 1 bird—which died soon after examination—harbored seven shaft lice. The surviving 3 were free of lice; in 67 days, 1 was still free, 1 harbored five body lice, and 1 harbored incipient infestations of both species. Dipping 12 infested birds in low concentrations of wetting agents either with or without solvents gave poor control of both forms of lice. Spraying 12 birds individually with 2.5 percent DDT emulsion at 32.8 to 39.1 cc. per bird gave complete control of body, shaft, and fluff lice within 40 to 48 hr.; released into an infested flock, these birds remained free of lice up to 15 to 19 days. Sodium fluoride (0.7 percent) sprayed individually on 8 birds at 31.1 to 32.2 cc. per bird gave no control of body or shaft lice. In six flock-spraying trials of 2 to 5 percent DDT emulsions or suspensions applied at 22 to 280 cc. per bird, all three species of lice were controlled for 36 hr. to 7 days; one trial with 2.5 percent DDT emulsion at 47 cc. per bird failed to control body lice at the end of 6 days. Spraying of floors, roosts, and nests with a 2.5 percent DDT emulsion at 6.3 to 20 cc. per square foot gave full control within 26 days; 2 to 5 percent dusts similarly applied at 0.8 to 3.9 gm. per square foot were generally unsatisfactory against all three species of lice. Shaft and fluff lice were more susceptible to control by spraying and dusting than were body lice.

DDT as a larvicide against Simulium, G. B. FAIRCHILD and E. A. BARREDA (*Jour. Econ. Ent.*, 38 (1945), No. 6, pp. 694-699).—In these tests against *Simulium* (several species of blackflies or buffalo gnats) breeding in swift mountain streams in Guatemala, use was made of an emulsion containing 4 percent DDT made from a stock concentrate containing 20 percent DDT, 20 percent Triton X-100, and 60 percent xylene; complete eradication of the larvae from streams for distances up to 10 km. was effected at concentrations of 1 part DDT to 10 million parts water. Efforts to prolong larvicidal action by absorbing emulsions and solutions of DDT on porous substances proved unsuccessful, but the method offers possibilities for treatment of small streams. Trials of turpentine and crude saponin from soap berries indicate them to be moderately effective as solvent and emulsifying agents, respectively; they might economically replace xylene and Triton in Guatemala. In further tests, DDT powder made into a suspension in water with a wetting agent gave kills as satisfactory as those obtained with emulsions.

The rabbit tick (Haemaphysalis leporis-palustris Pack.) as an ectoparasite of man, J. H. BROWN (*Canad. Ent.*, 77 (1945), No. 9, p. 176).—Note on a case.

Honeybees and legume seed production, C. M. HARRISON, R. H. KELTY, and C. BLUMER (*Michigan Sta. Quart. Bul.*, 28 (1945), No. 2, pp. 85-89).—As a result of

records kept during 1943-44, together with certain unpublished data from the station, it is concluded that honeybees have relatively little effect on the setting of alfalfa seed. In the production of alsike and white clovers, on the other hand, bees are essential to seed setting and, for good yields, seed fields should not be over 1 mile from a bee yard and preferably under a mile. Harvesting techniques should be improved to obtain full benefits of the increased bee activity.

Winter cluster temperature, V. G. MILUM. (Univ. Ill.). (*Gleanings Bee Cult.*, 72 (1944), No. 11, pp. 473-475).—The importance of having adequate stores of honey above the central portion of the cluster is stressed; stores in contact only with the lateral edge of the cluster may be of little value to the general cluster since during prolonged cold the chilled bees of the lateral edges and bottom of the cluster cannot produce heat or pass the stores on to the main body of the cluster.

Movement of bees in edge of cluster, V. G. MILUM (*Gleanings Bee Cult.*, 72 (1944), No. 12, pp. 516-518).—A continuation of the preceding. "The oft-expressed idea of the interchange of bees from the outside edge to the inside of the cluster is one that should be tempered with an additional qualifying phrase stating at what outside temperatures the colony is exposed but better still, what is the temperature surrounding the cluster. . . . Since . . . motionless bees are chilled at a point near 42° F., we suspect that at cluster-surrounding temperatures (not outside-of-hive temperatures) even a little higher, there will be no interchange of bees from inside to outside the cluster." Top ventilation prevents condensation, but possibly top insulation sufficient to prevent condensation of moisture and heat loss and a larger entrance for more ventilation with some provision against snow clogging would be the answer to overchilling of bees.

Investigations on materials suggested as bee repellents, F. R. SHAW and A. I. BOURNE. (Mass. State Col.). (*Gleanings Bee Cult.*, 74 (1946), No. 2, pp. 77-79, 115).—For years beekeepers have hoped for some material which—added to insecticidal and fungicidal sprays or dusts—would repel bees from poisoned foliage. In this study, creosote, carbolic acid, and Milkol were tested for this purpose. Addition of such substances did reduce the life span of the bees; whether this was due to starvation because of the repellent action or to actual poisoning remains undetermined. Creosote mixtures also caused varying degrees of blossom injury to apple, though the importance of this damage might conceivably vary with the time of application. Before the use of any repellent material is recommended it should be thoroughly tested to determine its effects on both plants and bees. A brief review of previous investigations is given.

The incidence and distribution of some diseases of the adult honeybee (*Apis mellifera* L.) in England and Wales, C. G. BUTLER (*Ann. Appl. Biol.*, 32 (1945), No. 4, pp. 344-351, illus. 4).

The acidity of honey, H. A. SCHUETTE and F. J. SCHUBERT. (Univ. Wis.). (*Wis. Acad. Sci., Arts, and Letters, Trans.*, 36 (1944), pp. 427-433).—The pH of all samples studied lay between 3.16 and 4.52; geographical origins appeared to exert little influence. The comb honeys had a lower pH (3.52) than the extracted honeys packaged in glass or tin containers; there was practically no difference as to type of container here. The percentage of ash varied over a wide range; in general, it went up with increases in both pH and color.

ANIMAL PRODUCTION

Principles of animal production, C. P. McMEEKAN ET AL. (*Christchurch, N. Z.: Whitcombe & Tombs*, [1943], pp. 243+, illus. 56).—The general principles of the production of various classes of livestock, with special emphasis on reproduction and breeding, particularly as practiced in New Zealand.

Index to the Proceedings of the American Society of Animal Production (*Jour. Anim. Sci.*, 5 (1946), No. 1, pp. 87-138).—In an attempt to index the early papers of this society, those published by the American Society of Animal Nutrition from 1908 and later combined with the American Society of Animal Production through 1940 have been grouped and listed by subject and author.

[Experiments in livestock production by the Bureau of Animal Industry]. (Partly coop. Ga. Coastal Plain, Tex., and Okla. Expt. Stas., et al.). (*U. S. Dept. Agr., Bur. Anim. Indus. Rpt.*, 1945, pp. 5, 6, 7-10, 11-15, 19-20; also in *U. S. Dept. Agr., Agr. Res. Admin. Rpt.*, 1945, pp. 53, 54, 55-58, 59-61, 63, 67-68).—Largely in continuation of previous studies (E. S. R., 92, p. 819), brief results are given of thickness of fat as an index of hog carcass quality, a histological study of tenderness of different cuts of beef, the effects of different ways of feeding phosphorus supplements including bone meal (in self-feeders, in drinking water and for fertilization of pastures), use of defluorinated fused phosphate, surplus sweetpotato products for beef and milk production, milo heads less satisfactory than threshed milo for beef production, cottonseed meal useful for wintering cattle, crop lands grazed to advantage by beef cattle, defluorinated phosphate satisfactory for lambs, improvement of sheep forage by range research, studies of wool and mohair properties, investigation of vitamin A deficiency in growing and fattening pigs, need of protein supplements shown by feeding records of 2,324 pigs, a uremic condition in young pigs, necrotic enteritis in swine usually caused by nicotinic acid deficiency symptoms, satisfactory horse rations from roughages and concentrates compressed into pellets, soybean meal a less desirable protein in mashes for breeding stock than in other feeds, loss of yellow pigment from chicks promoted by vitamin A, and growth of chicks in hot weather improved by artificial light.

Composition and feeding values of green maize, millet, and bulrush millet cut for soiling purposes. M. H. FRENCH (*East African Agr. Jour.*, 11 (1946), No. 3, pp. 159-161).—Corn, millet, or bulrush millet grown under irrigation in the dry seasons would form a valuable green supplement to rations of high-producing stock, but these green feeds should be supplied with adequate amounts of protein.

Rations for fattening cattle in Arizona. E. B. STANLEY (*Arizona Sta. Bul.* 198 (1945), pp. 16).—In several tests miscellaneous feeds for fattening cattle were tried. In five tests of about 120 days in duration, an average daily gain of 2.15 lb. was made by 49 steers receiving hegari silage with barley, cottonseed meal, and alfalfa hay, as contrasted with 1.80 lb. by 49 steers receiving similar feeds but no silage but otherwise similar feeds and more alfalfa hay. It was calculated that hegari silage had slightly less than 60 percent the value of alfalfa hay. In six further experiments of about 120 days' duration, steers with hegari silage made an average daily gain of 2.30 lb. as contrasted with 2.18 lb. by steers with Manko (a new grain sorghum) silage, which had a little more than 80 percent the value of hegari silage when fed with alfalfa hay, cottonseed meal, and grain. Grapefruit cannery refuse silage fed with these feeds was 82 percent as valuable as hegari silage, but because of the slimy compacted state of this material and extensive shrinkage and spoilage in ensiling and handling it this feed cannot be considered an economical substitute for hegari silage. Whole cottonseed had a replacement value of 88 percent for cottonseed meal when fed in a ration including silage, and 97 percent of the value of cottonseed meal when fed without silage. Additions of molasses to a ration of barley, cottonseed meal, hegari, silage, and alfalfa hay did not improve it. The most effective use of molasses was in rations without silage and of relatively poor palatability for fattening. A few tests showed that rolled barley was preferred to ground barley. The usual superiority of wheat over barley was not evident, but wheat may be substituted for barley if the market price favors the change, although wheat must be carefully fed, especially to calves. In over 6 years' experi-

ments with wheat, 547 cattle showed that top grade Arizona weaner calves may be finished into baby beeves following 60 days on alfalfa hay, hegari silage, and cottonseed meal. Dehydrated potato meal seemed equal to barley as a partial replacement.

Dried molasses-beet pulp and beet molasses for fattening cattle, H. P. SINGLETON, M. E. ENSMINGER, and W. W. HEINEMANN (*Washington Sta. Bul.* 469 (1945), pp. 31, illus. 10).—Feeding trials were conducted in three 120-day feeding periods to ascertain the replacement value of dried molasses-beet pulp for all or part of the corn, wheat, or barley in rations with chopped alfalfa hay, steamed bone meal, and salt. The cereals were fed alone or supplemented with one-third, one-half, or one-sixth part of dried molasses-beet pulp, replacing either corn, barley, or wheat or combinations of these. With mature steers, high quality hay, and a feeding period of 120 days, dried molasses-beet pulp may be fed satisfactorily up to 50 percent of the ration of corn, barley, or wheat during years of favorable price relationships. About 75 lb. of the grain was replaced by 100 lb. of the dried molasses-beet pulp. There was a slight decrease in hay consumption and gain. Comparative feed prices, rather than feed efficiency, determined costs. Dried molasses-beet pulp was a good appetizer.

A statistical comparison of the influence of crude fibre on the digestibility of roughage by *Bos indicus* (Zebu) and *Bos taurus* cattle, J. DUCKWORTH (*Trop. Agr. [Trinidad]*, 23 (1946), No. 1, pp. 4-8, illus. 3).—"A statistical study was made of the influence of crude fiber on the digestibility of organic matter in roughage, using American and Indian data. The correlation between crude fiber and organic matter digestibility was highly significant and negative for both *B. taurus* consuming temperate zone fodders and *B. indicus* consuming tropical fodders. The association between crude fiber and organic matter digestibility was, however, less in the Indian data than the American. Each increase of 1 percent in crude fiber content depressed the digestibility of the organic matter by 0.9 percent in the American studies but only by 0.5 percent in the Indian studies. Tropical roughage of low fiber content showed lower digestibility coefficients when fed to Zebu stock than did temperate zone roughage fed to *B. taurus* stock. Because of the lower regression of digestibility on crude fiber in tropical roughage fed to Zebu, there was little difference in comparison of high fiber roughage."

Chemical composition and digestibility of flat pea forage in three stages of maturity, T. W. DANIEL, F. B. WOLBERG, V. L. MILLER, J. H. ALSWAGER, M. E. ENSMINGER, and A. A. SPIELMAN. (Wash. Expt. Sta.). (*Jour. Anim. Sci.*, 5 (1946), No. 1, pp. 80-86).—The apparent digestibility of flat pea forage (*Lathyrus sylvestris wagneri*) at three stages of maturity was ascertained in fresh and dry form with sheep. The fresh and artificially dried materials were palatable and highly nutritious. However, the losses of several sheep during the first weeks of feeding indicated the need for caution until more is known about the possible toxicity of flat peas. The fresh green forage contained an average of 29.6 percent digestible protein and 69.8 percent total digestible nutrients as compared with 26.0 and 67.3 percent, respectively, in the artificially dried forage. The fresh green flat peas in the preblossom stage contained 34.26 percent digestible protein, the early bloom stage 30.17 percent, and the late bloom stage 24.32 percent. The total digestible nutrient contents in these three stages of maturity were 74.94, 68.86, and 65.44 percent, respectively. The artificially dried flat pea had digestible protein contents of 30.72, 27.09, and 20.12 percent, and total digestible nutrient contents of 73.47, 65.54, and 62.96 percent, respectively, at these three stages of maturity.

Nutritive requirements of breeding ewes for maintenance, lactation, and growth, C. L. SHREWSBURY, C. HARPER, and F. N. ANDREWS. (Ind. Expt. Sta.). (*Jour. Anim. Sci.*, 5 (1946), No. 1, pp. 47-54).—Two additional experiments (E. S. R.,

87, p. 556; 89, p. 719) showed the deficiencies of oat straw and the nutritive value of cereal grass fractions. Dehydrated ryegrass and oatgrass were found to have a high nutritive value with corn and silage for breeding ewes. First-cutting alfalfa hay was only slightly better than oat straw, but the second-cutting alfalfa hay approached the third cutting in nutritive value. The necessary supplementing factors for optimum performance of the breeding ewe were not present in the water-soluble fraction of ryegrass. The residue after water extraction retained the factors in concentration resembling the original cereal grass. Additions of protein (casein) and crystalline vitamins to the oat straw ration or a protein supplement of soybean meal and a poor quality alfalfa hay ration improved the ration but did not make it equal to rations containing dehydrated cereal grass. The study was conducted in 1942-43 with 12 lots of 15 2-year-old ewes and in 1943-44 with 5 lots of 10 3-year-old ewes and 4 lots of 15 4-year-old ewes each.

The phosphorus requirement of ewes for pregnancy and lactation, W. M. BEESON, R. F. JOHNSON, D. W. BOLIN, and C. W. HICKMAN (*Idaho Sta. Bul. 266 (1945), pp. 11*).—Continuing previous studies (E. S. R., 91, pp. 324, 452), it is shown that a level of 0.14 percent or less P in the ration of ewes is on the border line for adequately maintaining a normal P balance for pregnancy and is definitely inadequate for lactation. Rations containing 0.16 to 0.19 percent P were adequate for gestation. This allowed a daily intake per ewe of 3.21 to 3.26 gm. or 2.47 to 2.43 gm. per 100 lb. live weight. In practical terms, a ewe receiving 3.5 to 4 lb. of good quality alfalfa hay (0.19 to 0.22 percent P) daily would be amply supplied with P. The P requirement of a lactating ewe may be met by feeding rations containing 0.23 percent or more. Ewes should be wintered during gestation on range forage or roughage containing 0.16 percent or more P, and after lambing the addition of 1 lb. or more of grain to the alfalfa-salt ration will supply sufficient P. The study was conducted with 167 crossbred white-faced ewes. Blood P values were ascertained at frequent intervals.

Wintering breeding ewes in Alaska, W. J. EBERT (*Alaska Sta. Cir. 6 (1945), pp. 8, illus. 1*).—In 5 yr. Hampshire ewes were wintered successfully on seven different rations of locally grown roughages, mainly chopped tide-flat hay, chopped or unchopped oat-pea hay, or silage, or a combination of roughages. The ewes also produced a good fleece and a crop of healthy, vigorous lambs.

Waxy corn versus non-waxy corn for growing fattening pigs fed in dry lot, L. E. HANSON. (Nebraska Expt. Sta.). (*Jour. Anim. Sci.*, 5 (1946), No. 1, pp. 36-41).—Three trials were conducted for a comparison of nonwaxy and waxy corn for self-feeding of pigs with protein and mineral supplements, which showed practically equal results as far as gains and economy of feeding were concerned. In lots given a choice of both kinds of corn, about 2.6 times as much of the nonwaxy corn was consumed, but the over-all response of pigs fed only waxy corn was fully equal to that of the pigs fed nonwaxy corn. Chemical analyses showed the waxy corn to contain slightly more protein, fiber, ether extract, and ash, but less nitrogen-free extract.

Cull peas as a protein supplement for fattening hogs on pasture, W. P. LEHRER, JR., W. M. BEESON, and A. WILSON (*Idaho Sta. Cir. 108 (1946), pp. [4]*).—Three groups of 12 pigs each, averaging 58 lb. per head, were fed rolled wheat on pasture with protein supplements for 98 days. The protein of one group was made up of one-third ground peas and two-thirds meat meal. In the second group this consisted of 10 percent meat meal and 90 percent peas. The third protein supplement consisted of peas only. The average daily gains of the three groups were, respectively, 1.39, 1.47, and 1.55 lb. Favorable gains were thus made with cull peas alone. These are palatable and can be used to good advantage when the hogs are fattened on good pasture.

Addition of synthetic nutrients to protein supplemental feeds in swine rations, E. F. FERRIN. (Minn. Expt. Sta.). (*Jour. Anim. Sci.*, 5 (1946), No. 1, pp. 42-46).—The possibility of improving soybean meal protein by additions of choline and methionine was investigated with five lots of about nine 50-lb. pigs each fed for 103 days. All lots received 70 to 78 percent ground yellow corn, dried whey, and alfalfa meal. Individual lots received protein supplements of 14 percent tankage, 12.2 percent sardine meal, and the last three lots 19.6 percent soybean meal each, with two of these having added 0.1 percent choline chloride and *dl*-methionine, respectively. All lots received some riboflavin and niacin. The average daily gains per head with the protein supplements were tankage 1.38, sardine meal 1.60, soybean meal alone 1.41, soybean meal with choline 1.34, and soybean meal with *dl*-methionine 1.40 lb. The addition of choline to the soybean meal had a depressing effect on the feed consumption and rate of gain, whereas the addition of methionine to the soybean meal did not alter the daily gain or feed consumption in spite of severe scouring. The results of a reversal experiment indicated that the scouring may have been caused by a more active intestinal flora, because it was arrested by the oral administration of sulfathaladine.

The relation of the amount of thiamine in the ration of the hog to the thiamine and riboflavin content of the tissue, W. W. HEINEMANN, M. E. ENSMINGER, T. J. CUNHA, and E. C. McCULLOCH. (Wash. Expt. Sta.). (*Jour. Nutr.*, 31 (1946), No. 1, pp. 107-125, illus. 2).—Essentially noted (E. S. R., 94, p. 654).

Single weight versus a three-day-average weight for swine, H. W. BEAN. (Univ. Ill.). (*Jour. Anim. Sci.*, 5 (1946), No. 1, pp. 30-35, illus. 1).—Over a period of years, the deviations of the first-day and final weights from the 3-day averages of 3,323 pigs in self-feeding experiments were ascertained. The deviations between the first-day weight and the 3-day average increased as the size of the pig increased. Apparently the excitement created in handling the animals the first day had considerable influence on the second-day weight, and this condition is reflected in the 3-day average. There was usually less variation in the first-day weight than in the second or third or in the average. Thus errors are usually introduced in the 3-day average rather than making them smaller. Statistical analyses failed to show any advantage for using the 3-day average weight rather than a single weight at the beginning and again at the end of the feeding experiment. Careful weighing and reading scales on one day is therefore recommended.

Successful broiler growing, E. HOFFMANN and H. A. JOHNSON (*Mount Morris, Ill.: Watt Pub. Co., 1946, pp. 186, about 50 illus.*).—A popular presentation of broiler production, with emphasis on economic phases.

Vegetable protein concentrates fed alone and in combination with soybean oil meal and fish meal as the chief supplementary protein in chick starting rations, G. F. HEUSER, L. C. NORRIS, and J. MCGINNIS. (Cornell Univ.). (*Poultry Sci.*, 25 (1946), No. 2, pp. 130-136, illus. 2).—Different proteins were compared as the single source of protein in 24 lots of 25 chicks each, with weights ascertained to 8 weeks of age. Soybean meal as the only source of protein in the starting ration produced heavier birds than peanut meal or wheat germ meal, but they in turn were better than cottonseed meal and corn gluten feed or linseed meal, which was definitely unsatisfactory. Replacing one-half of the protein of various vegetable protein concentrates with soybean meal protein improved the growth so that there was little difference between them, but linseed meal was still poor. The supplementary effect of soybean meal was greater for cottonseed meal and corn gluten feed than for peanut meal and wheat germ meal. In 11 of the lots 3 percent fish meal was included with the other sources of protein. The inclusion of the fish meal increased the response, which seemed to be additive rather than supplementary, indicating that it was not due chiefly to amino acids. Various combinations of fish meal, soybean

meal, peanut meal, wheat-germ meal, cottonseed meal, corn gluten feed and linseed meal resulted in average weights classified as good, medium, and poor, the averages being 653, 508, and 324 gm., respectively. All rations classified as good included fish meal. Mortality was generally lowest in the lots showing most favorable growth. Livability seemed to be improved by fish meal, peanut meal, and wheat-germ meal. Gains were more economical on rations making good growth. Feed efficiency was increased by the inclusion of fish meal or soybean meal in the ration. The increase due to soybean meal was more marked when the rations included cottonseed meal or corn gluten feed than when they contained peanut meal or wheat-germ meal.

Chick growth response resulting from methionine additions to various protein supplements with pea protein, D. W. BOLIN, C. F. PETERSEN, C. E. LAMPMAN, and O. E. STAMBERG. (Idaho Expt. Sta.). (*Poultry Sci.*, 25 (1946), No. 2, pp. 157-161).—Since Alaska pea meal was found to be deficient in methionine (E. S. R., 92, p. 102), the supplementary value of several proteins were investigated. There was a marked difference in the supplementary value of various feeds when fed with pea meal. Additional methionine was required in all rations to obtain maximum growth response, but there was a wide difference in various protein sources to supply methionine. Rendering plant meat meal produced average gains of only 54.9 gm., and packing plant meat meal produced gains of only 21.7 gm. However, with methionine the growth response was equal to that obtained by methionine-supplemented fish meal. Among the supplements tested, herring fish meal, casein, and dried milk were excellent supplements to the pea meal. The combination of pea meal and soybean meal used would not promote satisfactory growth even at the high levels in a chick starter mash because of a methionine deficiency. Groups of eight chicks each were provided with the supplementary rations for 2-week periods. All the supplements included tests with 0.25 percent methionine.

Choline-like nutritional effect of dimethylaminoethanol, T. H. JUKES and J. J. OLESON (*Jour. Biol. Chem.*, 157 (1945), No. 1, pp. 419-420).—Groups of 10 New Hampshire chicks were placed on rations which contained 18 percent casein and which were similar to those used in previous experiments.² When no supplements were added to this ration, 50 percent of the chicks developed perosis in 21 days and 60 percent in 28 days, whereas with supplements of 0.2 gm. of diethylaminoethanol or 0.1 gm. of choline chloride per 100 gm. of basal ration no perosis developed and gains in live weight in 28 days were 145 and 194 gm. as compared with 112 gm. in the group receiving no additional supplement. The structure of the molecule of diethylaminoethanol is considered as indicating a possible source of choline formation.

An unexpected high requirement of chicks for pyridoxine, H. L. LUCAS, G. F. HEUSER, and L. C. NORRIS. (Cornell Univ.). (*Poultry Sci.*, 25 (1946), No. 2, pp. 137-142, illus. 2).—Symptoms of pyridoxine deficiency appeared in crossbred Rhode Island Red × Barred Plymouth Rock chicks, even though the rations were supplemented with pyridoxine in supposedly adequate amounts. Both purified and simplified rations were fed. The possibility was pointed out that the high requirement may have been due to genetic factors and also that the ration may have been contributing to this deficiency.

Supplements for distillers' by-products in poultry breeding diets, R. T. PARKHURST and J. W. KUZMESKI. (Mass. Expt. Sta.). (*Poultry Sci.*, 25 (1946), No. 2, pp. 162-172, illus. 5).—"Milo-rye distillers' dried grains with solubles and distillers' dried solubles were used in complete all-mash diets. Riboflavin, pantothenic acid, choline, and biotin determinations of the diets were made, in addition to the usual chemical analyses. Excellent hatchability results were obtained with a diet

² *Jour. Biol. Chem.*, 146 (1942), No. 1, pp. 19-24.

containing 20 percent of dried distillers' grains with solubles and as little as 1.25 percent of Redfish meal as the only animal or marine protein supplement. Good results were obtained with 2.5 percent of meat scraps in the total ration. Two groups, one getting a diet containing 3 percent of liver meal as a supplement to 5 percent of distillers' dried solubles and the other a mixed protein diet, gave equally good hatchability. Very poor hatchability was obtained with all diets not containing some animal or marine protein concentrates. There was no indication that animal and marine protein concentrates were essential for egg production, egg size, palatability, feed efficiency, maintenance of body weight, or livability. Egg production, feed efficiency, and body weight maintenance seemed to be slightly better with diets containing distillers' dried solubles than with those containing the distillers' dried grains with solubles but were satisfactory with both products. The addition of choline chloride, synthetic riboflavin, and pantothenic acid to diets without animal proteins, and also to those containing meat scraps, did not improve their value for hatchability or egg production."

The effect of feeding cow manure on egg production and hatchability, D. WHITSON, H. W. TITUS, and H. R. BIRD. (U. S. D. A.). (*Poultry Sci.*, 25 (1946), No. 2, pp. 143-147, illus. 1).—Contrary to the findings of Hammond (E. S. R., 88, p. 518), the inclusion of 8 percent of dried cow manure of high androgenic potency in a good practical all-mash ration significantly impaired egg production in a 48-week experiment. When the androgen potency of the cow manure was destroyed by drying at 80° C. for 24 hr., there was no effect on egg production. High hatchability was supported whether or not the ration was supplemented with cow manure. The inclusion of the dried cow manure in a ration high in soybean meal and containing no animal protein significantly improved hatchability, and largely eliminated the seasonal variation in hatchability which was characteristic of the basal ration used.

The use of various vitamin supplements in rations for laying and breeding hens, W. W. CRAVENS, J. G. HALPIN, and W. H. MCGIBBON. (Wis. Expt. Sta.). (*Poultry Sci.*, 25 (1946), No. 2, pp. 99-104).—To ascertain if vitamin supplements other than riboflavin are essential in laying and breeding rations of practical feeding stuffs and to evaluate certain products for possible use in laying and breeding rations (E. S. R., 93, p. 612), fish solubles, ground fish viscera, and solubilized liver extract were tested. No significant differences in egg production were found between the basal ration and rations containing the various supplements. When alfalfa meal was fed at a level of 2 percent, 0.6 mg. of riboflavin was an effective supplement. When only riboflavin was added to rations containing no alfalfa meal, the hatchability of the eggs was unsatisfactory. Dried skim milk was also ineffective at levels of 2.5 percent. A significant increase in hatchability occurred when fish solubles and solubilized liver extract were fed in addition to riboflavin.

Oyster shells, calcite grit, ground limestone, and granite grit in rations for hens, G. F. HEUSER and L. C. NORRIS. (Cornell Univ.). (*Poultry Sci.*, 25 (1946), No. 2, pp. 173-179, illus. 3).—The results of an experiment in which oyster-shells, calcite grit, and ground limestone were compared as sources of calcium supplementary to that present in a representative commercial laying ration, the mash of which contained approximately 1 percent each of calcium and phosphorus fed as supplements to the laying ration with crushed oystershell and calcite grit gave better results as supplements to the laying ration than ground limestone, especially during the latter part of the year. There was no difference in egg production between hens getting crushed oystershell or calcite grit. Egg production was significantly lower on ground limestone than for the birds receiving crushed oystershell or calcite grit. Body weight was better maintained in hens receiving crushed oystershell than in those receiving calcite grit or ground limestone. The

birds receiving ground limestone showed higher mortality than the other groups. Eggshell strength rated in the order of oystershells, calcite grit, and ground limestone. Additional feeding of granite grit had a favorable effect on egg production and the pounds of feed required to produce a dozen eggs when fed with crushed oystershells or ground limestone. Calcite grit also had a favorable effect in this respect. Additional feeding of granite grit seemed to have no influence on body weight or mortality but a favorable influence on eggshell strength. Considering all factors studied, the best combination was the supplementation of the laying ration with crushed oystershells and granite grit. The studies were conducted over about 10 mo. with 6 lots of 60 Single-Comb White Leghorn pullets receiving oystershells, calcite grit, and 8 percent ground limestone added to each 100 lb. of mash, with and without granite grit. Data were recorded on the egg production, feed consumption, body weight, mortality, eggshell strength, and feed efficiency with the different grits.

Energy and gaseous metabolism of the chicken from hatch to maturity as affected by temperature, H. G. BAROTT and E. M. PRINGLE. (U. S. D. A.). (*Jour. Nutr.*, 31 (1946), No. 1, pp. 35-50, illus. 4).—More than 500 1-day experiments on the gaseous and energy metabolism of Rhode Island Red ♀ chicks of average ages of 4 days, 2, 5, 8, 12, 18, and 23 weeks, and 1 yr. were determined. The environmental temperatures ranged, at 5° intervals, from 20° to 103° F. Other conditions were relative humidity from 50 to 60 percent, oxygen content 21 percent, and CO₂ content less than 1 percent. Oxygen consumption was measured for each 2-hr. period, and the heat, water, and CO₂ elimination for each 4-hr. period. The results define the metabolic rate for each age of chicken studied, at each environmental temperature. A point of flexure occurred where metabolism was minimum, which was found at 95° for baby chicks and chicks 2 weeks of age. It became progressively lower with increasing age. The minimum occurred in 1-year-old hens at approximately 70°. The maximum occurred at the lowest temperature the chicken could survive, but the temperature was not determined for chickens older than 8 weeks. Each 24-hr. period showed a typical diurnal rhythm in the metabolism, with a maximum value at 8 a. m. and a minimum at 8 p. m. The amounts of the three feed constituents metabolized by the chick were protein 69 percent, fat 27 percent, and carbohydrate 4 percent. The observed respiratory quotient approximated 0.717 in all ages and at all temperatures. The observed oxygen thermal quotient was 3.11 and the observed CO₂ T.Q. 3.16. Water respiration below that where minimum metabolism occurred was fairly constant, but the large amount of water exhaled for cooling above this temperature made an enormous increase in water metabolism.

Periodic increase in lighting versus continuous lighting for layers, O. K. MOORE and N. R. MEHRHOF (*Florida Sta. Bul.* 420 (1946), pp. 12).—In 3 successive years, 2 lots of 50 Light Sussex pullets were exposed to different lighting conditions. In lot 1 in each of the 3 yr., the experimental periods were divided into 14-day intervals in which a changing schedule of artificial lighting was used. No artificial light was used in addition to daylight in the first interval in lot 1. In the second interval, the artificial light was provided from 5 a. m. to daylight and in the third interval from 3 a. m. until daylight, with a 2-hr. increase in succeeding intervals until the birds received continued lighting. The birds of lot 2 in each experiment were exposed to continuous lighting for the 24 hr.

The birds receiving the all-night lighting laid an average of 2.44 percent more eggs than those receiving the increased schedule of lighting. The gradual increase in length of day as administered in this experiment to birds in lot 1 produced a greater initial response in increased egg production, but later there was a greater refractoriness to light stimulation than occurred in all-night lighting. The birds receiving all-night lighting consumed 0.32 lb. less feed per dozen eggs than all

birds receiving the increased schedule of lighting. The time of laying was during daylight hours and was unaffected by the changing schedule of lighting used in lot 1.

The relationship of iris color to mortality and egg production in Single Comb White Leghorns. R. F. BALL. ([N. Y.] Cornell Expt. Sta.). (*Poultry Sci.*, 25 (1946), No. 2, pp. 105-114, illus. 4).—Data are presented on the relationship of iris color and irregularity of pupils to mortality and egg production in Single-Comb White Leghorns over a 3-year period. The findings involved the egg production of 4,662 pullets of the Cornell Resistant strain and 1,363 pullets of the Cornell Susceptible strain. At the time of housing, a large number of the pullets had depigmented irises, and at 500 days of age still more showed this condition. About 62 percent of the Resistant stock showed faded irises at 500 days, a condition which was believed to be related to the heavy egg production. Irregular pupils were frequently observed in ♀♀ of the Susceptible strain. The proportion of birds with faded irises and irregular pupils was increased in birds exposed to disease during the first 2 weeks of life. Susceptible pullets with depigmented irises had a greater rate of mortality from all causes than their sisters with normal iris color, although similar but insignificant losses from neoplasms were also seen in those with faded irises. In general, Resistant pullets with faded irises had but slightly greater mortality from all causes and from neoplasms than those classified as normal or reddish bay. There was no relation between the degree of iris depigmentation at housing time and the rate of mortality to 500 days of age. Pullets with irregular pupils experienced heavy losses in both Resistant and Susceptible strains. Low egg production was associated with iris depigmentation in Susceptible pullets, but not in those from Resistant stock. Neither the amount of depigmentation nor the disproportionate depigmentation of the left and right eye was related to egg production. Irregularity of pupils was indicative of a low rate of lay of both strains. Differences in mortality and egg production between ♀♀ with faded and normal irises were considerable in one strain (Susceptible) and only slight or nonexistent in the other strain (Resistant). The desirability of indiscriminately culling all ♀♀ with depigmented irises is questioned in view of these findings.

Directory of U. S. Register of Merit sires and dams qualifying under the National Poultry Improvement Plan, 1943-1944 (*U. S. Dept. Agr., Misc. Pub. 587* (1945), pp. 62).—The usual list of birds qualifying for the Register of Merit by breeds in 1943-44 (*E. S. R.*, 93, p. 67).

DAIRY FARMING—DAIRYING

[Investigations on dairy products and dairying by the Bureau of Dairy Industry] (*U. S. Dept. Agr., Bur. Dairy Indus. Rpt.*, 1945, pp. 2-7, 10-11, 12-15, 17; also in *U. S. Dept. Agr., Agr. Res. Admin. Rpt.*, 1945, pp. 100-105, 108-109, 110-113, 115).—Brief results are presented on the keeping quality of dried milk by double evacuation with inert gases, speeding up ripening of Cheddar cheese by raising the temperature and pasteurization, use of the phosphatase test to determine adequacy of pasteurization of milk for Cheddar cheese making, cheese whey may yield mold of the Roquefort-type cheese for use as a cheese spread, the physical condition of evaporated milk as related to spoilage, sugar may be more economically added to dried ice cream after drying than before, ice cream mixes need not be homogenized if homogenized cream is used, manufacture of a new type of canned milk with increased flavor, penicillin destroys bacteriological organisms which develop undesirable flavors, rate of grain feeding early in lactation for increasing milk yields, orchard grass and Ladino clover good pasture for dairy cattle, valuable fertilizing

material lost in dairy-barn drains, high vitamin A value of summer butter, high vitamin A value of winter milk with better hay-preserving methods, grain and corn silage produce milk without nutritional deficiencies, giving calves skim milk and grain at 5 to 12 days of age, and sanitary inspection of factories processing farm butter.

Artificial insemination of dairy cattle, II. A. HERMAN and A. C. RAGSDALE (*Missouri Sta. Bul.* 494 (1946), pp. 32, illus. 26).—General directions are given for carrying out artificial insemination of the dairy herd. Advantages and disadvantages of artificial insemination are briefly reviewed. The various genital organs of the ♂ and ♀ reproductive tracts are briefly described.

Simple vs. complex grain mixtures in dairy rations.—I, Winter feeding of milking cows, C. F. MONROE and W. E. KRAUSS (*Ohio Sta. Bimo. Bul.* 238 (1946), pp. 19-24).—A simple mixture of 77.5 percent ground shelled corn, 20 percent soybean meal, and 2.5 percent minerals was compared with a complex mineral mixture for effects on milk and butterfat production and feed consumed. The 28 milk cows used in the study were fed for 40 days on each ration. The average daily milk production of each group for the 40 days was approximately 40 lb., and there was no significant difference in production of the 5 heaviest producers in each group.

The thiamine, riboflavin, nicotinic acid, and pantothenic acid content of colostrum and milk of the cow and ewe, P. B. PEARSON and A. L. DARNELL. (Tex. Expt. Sta.). (*Jour. Nutr.*, 31 (1946), No. 1, pp. 51-57).—The colostrum and milk of the ewe were much richer in thiamine, riboflavin, and nicotinic acid than the colostrum and milk of the cow. The colostrum of both the cow and the ewe was much higher in thiamine and riboflavin than the milk of these species. The colostrum of the cow contained an average of 0.62 µg. of thiamine and 6.10 µg. of riboflavin per cubic centimeter, while the corresponding values for milk were 0.38 and 1.77 µg. per cubic centimeter. Colostrum of the ewe contained 1.08 µg. of thiamine and 20.08 µg. of riboflavin per cubic centimeter, while the corresponding values for the milk of ewes were 0.60 and 4.36 µg. per cubic centimeter. There was no significant difference in the nicotinic acid content of cow's colostrum and milk, but ewe's milk contained almost twice as much as the colostrum. The milk of both species contained more pantothenic acid than was found in colostrum. Within less than a week after parturition, the riboflavin and pantothenic acid of the cow's milk attained the level for normal milk, but the high level for thiamine persisted beyond the tenth day.

The relationship of sediment to the flavor of milk, J. C. MARQUARDT (*Jour. Milk Technol.*, 9 (1946), No. 1, pp. 5-11).—The percentage of clean milk produced in three plants increased through a well-organized clean-up program. Dirty-flavored products resulted when a high percentage of dirt was found in the milk. Properly filtered milk will hold the score of 21.5 for 1 week in the average refrigerator, but milk with excess sediment cannot be processed into a fluid milk that will hold a satisfactory flavor for more than 2 or 3 days. Bad mastitis conditions and high counts frequently decrease as more attention is given to keeping the milk physically clean.

Mastitis and the plate count of milk.—VI, The contribution of staphylococcal mastitis to the standard plate count of milk, and some cultural characteristics of the organisms isolated, H. W. SEELEY, JR., E. O. ANDERSON, and W. N. PLASTRIDGE. ([Conn.] Storrs Expt. Sta.). (*Jour. Milk Technol.*, 8 (1945), No. 5, pp. 259-263).—In continuation of these studies (E. S. R., 93, p. 188), samples of milk from cows with chronic mastitis ranged from 200 to 42,000 staphylococcus colonies per cubic centimeter, with an arithmetic mean of 6,800. Of 289 isolations, 72 percent were coagulase-positive, 36 percent were hemolytic, and 44 percent produced some pigment. The plate count was not correlated with the leucocyte count.

Producers of low-count milk may have difficulties in meeting bacterial standards because of the presence of staphylococcal-infected animals in the herd.

Sterilization of microorganisms, with special reference to new methods applicable to the dairy industry, O. RAHN. (Cornell Univ.). (*Milk Plant Mo.*, 34 (1945), No. 12, pp. 24-26, 46, 52, illus. 2).—Present knowledge of physical methods of sterilization makes it improbable that they will play a major role in the dairy industry. Chemical sterilization looks most promising. More data on the use of weak acids and synthetic detergents seem needed.

High-temperature short-time pasteurization, compiled by G. M. TROUT and A. W. FARRALL (*Michigan Sta. Spec. Bul.* 335 (1946), pp. 95, illus. 20).—The following papers were presented before the Special High-Temperature, Short-Time Pasteurization Conference held at Michigan State College, May 22-23, 1945: Some Advantages and Disadvantages of High-Temperature Short-Time Pasteurization (pp. 5-9), and How Does the Quality of the Milk Supply Affect Its Pasteurizability by the Short-Time Method (pp. 10-13), both by L. H. Burgwald (Ohio State Univ.); Problems in the Operation of High-Temperature Short-Time Pasteurization—Cleaning, Sterilizing, Maintenance, and Timing of Operations, by W. W. Cavanaugh (pp. 14-19); Experience in Checking High-Temperature Short-Time Pasteurization to Meet the Public Health Requirements, by H. Cohen (pp. 20-27); Lessons to be Learned From the History of High-Temperature Short-Time Pasteurization (pp. 28-33), and The Effect of the Time and Temperature of Pasteurization Upon Some of the Properties and Constituents of Milk (pp. 34-40), both by A. C. Dahlberg (Cornell Univ.); Principles Involved in Various Types of High-Temperature Short-Time Pasteurization, by A. W. Farrall (pp. 41-54); Thermal Death Points of Various Microorganisms and Their Relation to Pasteurization Time, by W. L. Mallmann (pp. 55-62) (Mich. State Col.); Routine Maintenance of High-Temperature Short-Time Pasteurization Control Systems, by R. E. Olson (pp. 63-73); Highlights of Research on High-Temperature Short-Time Pasteurization, by G. M. Trout (pp. 74-82) (Mich. State Col.); Factors to Consider Before Adopting High-Temperature Short-Time Pasteurization, by C. F. Weinreich (pp. 83-91); and Michigan's New Short-Time Pasteurization Law, by F. M. Skiver (pp. 92-95).

The control of slowness in making Cheddar cheese, A. T. R. MATTICK, A. A. NICHOLS, and J. Z. WOLF (*Canad. Dairy and Ice Cream Jour.*, 24 (1945), No. 10, pp. 23-24, 50, 52).—Slowness in making cheese, usually due to the action of phages on specific organisms which are air-borne, may be best controlled in a simple isolated laboratory where starters are produced under regulated conditions.

Sugar conservation practices, W. J. CAULFIELD. (Iowa State Col.). (*Ice Cream Rev.*, 29 (1946), No. 7, pp. 42-43, 68-74, illus. 1).—The current sugar shortage in the ice cream industry may be met by reducing the gallonage of ices and sherbets, moderate reduction in the sugar content of the mix with an increase in the serum solids and stabilizer content of the mix, and replacement of sucrose with alternative sweetening agents.

VETERINARY MEDICINE

[**Research in animal diseases**]. (Partly coop. Ga. Coastal Plain Expt. Sta. et al.). (*U. S. Dept. Agr., Bur. Anim. Indus. Rpt.*, 1945, pp. 2, 22-49; also in *U. S. Dept. Agr., Agr. Res. Admin. Rpt.*, 1945, pp. 50, 70-97).—Progress reports are made on disease-control measures to reduce livestock losses, studies of vesicular diseases, infectious equine encephalomyelitis, equine infectious anemia, hog cholera, bovine and swine brucellosis, hormones for treatment of sterility in cows, limitations of

penicillin for mastitis of cattle, control of fowl typhoid, persistence of anthrax organisms, swine erysipelas, infection in chickens and control by vaccination, serological diagnosis of dourine and glanders, tests for pullorum disease in turkeys, tuberculin and related allergens, John's disease in cattle, control of strongyles in horses and cattle parasites by phenothiazine, cattle-grub control, DDT for hog lice and sheep ticks, hexachlorethane-bentonite suspension for liver fluke in sheep, relation of diet to hookworms in lambs, antimony compounds for filariasis in sheep, phenothiazine for goat parasites, swine sarcocysts found to be fungi, control of swine parasites, sulfa drugs for cecal coccidiosis in poultry, eradicating scabies, dourine, ticks, tuberculosis, hog cholera, John's disease, and brucellosis, and virus-serum control.

[**Miscellaneous papers**] (*Cornell Vet.*, 35 (1945), No. 4, pp. 333-335, 365-373, 375-381, illus. 3).—These papers include A Simple Instrument for the Relief of Dystocia in the Bovine Due to Uterine Torsion, by A. R. Demott and S. J. Roberts (pp. 333-335) (Cornell Univ.); Ketonemia in Fetuses of a Heifer and a Ewe Affected With Severe Ketosis, by J. Sampson, C. C. Morrill, and J. O. Alberts (pp. 365-369) (Univ. Ill.); *Corynebacterium equi* Infection in a California Foal (pp. 370-373), and *Shigella equirulis* Infection in California (pp. 375-377), both by J. W. Britton (Univ. Calif.); and Treatment of Strangles in a Horse With Penicillin and Sulfamerazine, by S. J. Roberts (pp. 378-381) (Cornell Univ.).

Quantitative aspects of antigen-antibody reactions.—I, A theory and its corollaries. II, Some comparisons between the theory and the experimental results, T. TEORELL (*Jour. Hyg. [London]*, 44 (1946), No. 4, pp. 227-242, illus. 16).—In part 1 (pp. 227-236), a quantitative theory has been developed for the reactions between antigens and antibodies, applicable in particular to the precipitin reaction. The theory is equally applicable to unspecific precipitations, for instance the reaction between proteins and protein precipitating agents such as nucleic acids, etc.

In part 2 (pp. 237-242), the quantitative theory for the interaction between antigen and antibody presented in part 1 has been compared with some experimental precipitin reactions published in the literature. These reactions include Type VIII pneumococcus polysaccharide-homologous (horse) antibody, egg albumin-(rabbit) anti-egg albumin, and diphtheria toxin-(horse) antitoxin. The general course of the experimental precipitation curves (total amount of precipitate, amounts of precipitated antigen and antibody) corresponded well to the theoretical type curves. With regard to the location of the "equivalence zones," experiment and theory also showed a satisfactory agreement.

A hypothesis on the velocity of flocculation in the precipitin reaction is presented and compared with some recent results. The relation between the immunological concepts "equivalence (neutral) point," "optimum point," and "maximum precipitation point" is also discussed.

Blood groups and blood transfusion in veterinary practice, A. E. LAGER (*Middlesex Vet.*, 4 (1945), No. 3, pp. 103-108, 123).—A review of blood groups in cattle, sheep, swine, and dogs is briefly presented, and mention is made of their significance in blood transfusion therapy. Indications and contraindications for blood transfusion, as well as transfusion reactions, are discussed. The technic of cross-matching, collecting, and administering blood is outlined.

The nature and action of the antibiotics, E. H. FRIEDEN (*Tex. Rpts. Biol. and Med.*, 3 (1945), No. 4, pp. 569-646, illus. 2).—A comprehensive review, the term "antibiotic" being defined as "a chemical substance, produced by one or more living organisms, which possesses more or less selective antimicrobial properties at relatively low concentrations." There are over 200 literature citations.

Influence of pH and temperature on the survival of coliforms and enteric pathogens when exposed to chloramine, C. T. BUTTERFIELD and E. WATTIE (*Pub.*

Health Rpts. [U. S.], 61 (1946), No. 6, pp. 157-192, illus. 5).—Results from 193 series of experiments conducted at pH 6.5, 7.0, 7.8, 8.5, 9.5, and 10.5 and at two temperature ranges (2°-6° and 20°-25° C.), with species of *Escherichia*, *Aerobacter*, *Pseudomonas*, *Eberthella*, and *Shigella*, indicated that chloramines are much less efficient as bactericidal agents than free chlorine.

Studies in the dynamics of disinfection.—V, The temperature coefficient of the reaction between phenol and Bact[erium] coli, derived from data obtained by an improved technique. VI, Calculation of a new and constant temperature coefficient for the reaction between phenol and Bact. coli, R. C. JORDAN and S. E. JACOBS (Jour. Hyg. [London], 44 (1946), No. 4, pp. 243-248, illus. 3; pp. 249-255, illus. 4).—The virtual sterilization time has been used as a measure of the rate of disinfection of *B. coli* cultures under carefully standardized conditions. The relationship of this time to temperature at each of five phenol concentrations has been reexamined. This relationship is such that a minimum or threshold temperature exists for each concentration.

Research on phenothiazine as an anthelmintic, P. D. HARWOOD (Sci. Mo., 62 (1946), No. 1, pp. 32-42, illus. 5).—This popular account deals especially with the work of the U. S. Department of Agriculture in combating nodular-worm disease of sheep and other parasitic diseases of domestic animals.

The relationship of vitamin C to wound healing, C. L. DAVIDSON (Vet. Med., 41 (1946), No. 4, pp. 140-141, illus. 1).—The importance of an adequate supply of vitamin C in wound healing is pointed out, and its administration to small animals following surgery is suggested under certain conditions.

Occurrence of *Brucella melitensis* in Iowa, C. F. JORDAN and I. H. BORTS (Jour. Amer. Med. Assoc., 130 (1946), No. 2, pp. 72-75).—*B. melitensis* was isolated from the blood of 20 men, 10 of whom were farm residents and 10 packinghouse employees. The disease is now considered to be endemic in Iowa. It is thought that hogs were the probable and major source of infection.

Further isolation of St. Louis encephalitis virus; congenital transfer of virus in chicken mites (*Dermanyssus gallinae*), M. G. SMITH, R. J. BLATTNER, and F. M. HEYS (Soc. Expt. Biol. and Med. Proc., 59 (1945), No. 2, pp. 136-138, illus. 1).—Three further isolations from mites collected at the original site (E. S. R., 92, p. 420), and one isolation from each of two other chicken houses in St. Louis County, Mo., are reported.

Un piroplasma del tipo "Nuttallia equi," parasito de "Didelphis paraguayensis" en Colombia [A piroplasm of the *N. equi* type, a parasite of *D. paraguayensis* in Colombia], M. R. GARCIA (Rev. Med. Vet. [Bogotá], 14 (1945), No. 89, pp. 70-79, illus. 5; Eng. abs., p. 73).—This piroplasm was found in opossums and is thought to be the first record of a piroplasm from a marsupial host.

Warm-stage observations on the development of pseudo-mycelia in cultures of avian tubercle bacilli grown in dilute embryo extract, E. M. BRIEGER and H. B. FELL (Jour. Hyg. [London], 44 (1946), No. 4, pp. 256-263, illus. 3).—"The results of this investigation shed light on the controversial question of whether the 'mycelial' form of the tubercle bacillus is a single individual formed by 'true' lateral budding or a composite structure produced by the terminal angular growth of coherent but independent bacilli. Our observations on the living organisms have shown that under appropriate experimental conditions both these forms may develop."

The toxicity of a spurge (*Phyllanthus abnormis*) for cattle, sheep, and goats, F. P. MATHEWS. (Tex. Expt. Sta. coop. U. S. D. A.). (Cornell Vet., 35 (1945), No. 4, pp. 336-346, illus. 4).—Serious cattle losses in Culberson County, Tex., were found to be characterized by hepatic cirrhosis but not associated with the grazing

of *Senecio*. The presence of a toxic principle in another common plant, *P. abnormis*, was demonstrated by feeding it to 12 cattle, 5 goats, and 4 sheep. A destructive action on the liver and kidneys was noted, but the experimental feeding did not produce an extensive cirrhosis of the liver. A variation in toxicity in the plants from different areas was observed. Drying the plant appeared to have a destructive effect on the toxic principle. Goats and sheep appeared to be more resistant than cattle.

Effect of infused penicillin in the bovine mammary gland, F. J. WEIRETHER, D. E. JASPER, and W. E. PETERSEN. (Minn. Expt. Sta.). (*Soc. Expt. Biol. and Med. Proc.*, 59 (1945), No. 2, pp. 282-286, illus. 2).—This report deals primarily with studies on the rate of decline and irritating effects of infused penicillin immediately after milking. In the experiments where the cows were milked at regular intervals after infusions, no demonstrable decrease in the quantity of milk was observed. In cases where the intervals between milkings were lengthened, there were decreases in the amounts of milk that could be accounted for by the intraglandular pressure resulting from the delay in withdrawing the milk. In all cases, there were observed changes in the character of the milk which varied in general with the quantity of penicillin infused. A few small flakes, with increases in chloride, and leucocytes were noted, as well as a slightly yellow color. The milk returned to normal in 3 to 4 days.

The following conclusions were drawn: "Aqueous solutions of penicillin (sodium salt) containing 5,000 Oxford units per milliliter had slight irritating effects on the normal bovine mammary gland as measured by physical examination of the gland, body temperature, and changes in the character and quantity of milk. The largest dose infused was 40 ml. (200,000 O. U.). Increase in body temperature, tremors, and greater changes in the character of the milk were observed after penicillin was introduced in large volumes of water. Largest volume infused was 950 ml. (190,000 O. U.). These effects may have been due to the pyrogenic properties in the water used. In glands infused with small volumes of water containing 5,000 O. U. per milliliter, the rate of decline of penicillin per milliliter of milk is greatest during the first 10 hr., after which the decline is at a slower rate. The milk contained 0.5 or more units of penicillin per milliliter 24 hr. after the infusion of 30,000 or more units. The disappearance rate from pathologic glands was of the same order as for the normal gland except in coliform infections. When penicillin was introduced in large volumes of water the infused water was rapidly absorbed, leaving most of the penicillin in the gland."

The opsonocytophagic test in bovine brucellosis, C. G. RICKARD. (Cornell Univ.). (*Cornell Vet.*, 35 (1945), No. 4, pp. 347-364, illus. 1).—In tests on cows of proved immune status, opsonocytophagic activity did not appear to be a measure of immunity but rather to indicate the presence of antibody in any amount above a certain low level. Cows known to be immune showed wide variation in opsonocytophagic activity, depending on the amount of circulating antibody present in their blood plasmas.

Tests on three vaccinated calves are also reported. In these, the rise in circulating antibody which occurs in calves after vaccination with the live Strain 19 vaccine was observed as simultaneous increases in opsonocytophagic and agglutinative activities. "These observations favor the belief that opsonin and agglutinin in brucellosis are the same antibody, demonstrated in different ways. If this is true, there is little use for the opsonocytophagic test, since the agglutination test is much simpler and easier to conduct."

Contagious abortion vaccine prepared from strain 45(20): Field vaccination trials, A. D. McEWEN (*Vet. Rec.*, 58 (1946), No. 6, pp. 57-64).—Field trials of the protection conferred against *Brucella abortus* infection by the inoculation of

heifers and cows of breeding age with a vaccine consisting of live culture of *B. abortus* strain 45(20) are described. Virgin heifers received two inoculations of vaccine and nonpregnant cows one inoculation of vaccine before service. As the vaccinated animals calved, those that were negative reactors to the agglutination test were revaccinated after every pregnancy. Vaccination of animals whose sera do not react positively to the agglutination test has been shown to confer protection against abortions caused by *B. abortus* infection. Moreover, vaccination which does not stimulate the production of serum agglutinins for *B. abortus* prevents all but a low percentage of animals exposed to infection from becoming positive reactors to the agglutination test for smooth strains of *B. abortus*.

The beneficial results derived from vaccination of nonreacting cattle in an infected environment were most clearly demonstrated in the second and later pregnancies following vaccination. Although the incidence of infection reaches its peak after the second pregnancy and a higher incidence of abortion occurs at the second pregnancy than at any other pregnancy, vaccination has been found to confer as satisfactory a protection against abortion and infection at this critical stage as at any other period. It is concluded that "vaccination, by limiting the spread of infection, should prove a valuable adjunct to a scheme for the eradication of contagious abortion when this is practicable, and . . . may be used to prepare the way for the introduction of a scheme of eradication."

Vaccination against Johne's disease, T. M. DOYLE (*Agriculture, Jour. Min. Agr. [Gt. Brit.]*, 52 (1946), No. 10, pp. 442-444).—Tests on a small scale with cattle and goats are cited from which it is concluded that "in view of the now ascertained safety of the vaccine, an extensive trial in this country with heavily infected herds in which the usual measures of control have failed would seem to be justified. It is at present being used on a few selected herds, and the results to date are encouraging."

Mastitis control, E. F. WALLER. (Univ. Vt.). (*Vt. Dairy Plant Oper. and Milk Distrib.*, Ed. Conf., 24 (1945), pp. 9-12).—A practical discussion of the control of this disease, which is stated to be second in importance in Vermont only to brucellosis.

A study of the diphtheroids found in infectious bovine pyelonephritis, E. S. FEENSTRA, F. THORP, JR., and C. F. CLARK. (Mich. Expt. Sta.). (*Jour. Bact.*, 50 (1945), No. 5, pp. 497-504).—Some of the morphological, staining, cultural, biological, fermentative, and agglutinative properties of 19 diphtheroids from cases of pyelonephritis have been determined, and an attempt has been made to classify them, especially according to their relationship to *Corynebacterium renale*. From the data presented it is thought likely that there are two distinct species of corynebacteria involved as etiological agents, although heretofore only one has been described.

Measures used in the control of an infectious type of calf scours, G. H. WISE and R. W. COARSEY. (S. C. Expt. Sta.). (*Cornell Vet.*, 35 (1945), No. 4, pp. 320-328).—Supplementing a previous investigation (E. S. R., 92, p. 565), a survey was made of a diarrhea prevalent among calves in a large purebred dairy herd. Health records of 185 calves were obtained. The most characteristic symptoms of the disease was acute diarrhea, with pneumonia often either an accompaniment or a sequel. The highest incidence was during the second week following birth. Although the syndrome resembled "white scours" in many respects, the later age incidence and the prolonged course were the primary atypical characteristics that led to the conclusion that etiologically the maladies are different.

Meticulous sanitation and attempted isolation in the immediate herd environs were ineffective in reducing the incidence, but segregation of a small group of calves with nurse cows in a remote area lowered the occurrence significantly.

Prepartum immunization of the dam with autogenous bacterin and subsequent immunization of the new-born calf with antibacterial serum lowered the incidence

but not below the critical level. Symptomatic treatment of the diarrhetic calves by means of sulfaguanidine reduced the mortality rate to almost negligible losses.

The administration of phenothiazine and hydrocarbons to sheep, J. H. WHITLOCK. (Cornell Univ.). (*Cornell Vet.*, 35 (1945), No. 4, pp. 328-332, illus. 3).—In an effort to find effective equipment for the administration of drugs to sheep, 868 adult sheep and 506 lambs were treated with phenothiazine and 110 adult sheep and 42 lambs with a Monnig-Ortlepp (E. S. R., 84, p. 523) suspension of tetrachloroethylene, using a metal esophageal tube described by J. H. Whitlock⁴ with various syringes and attachments. Some of the sheep given phenothiazine and all given tetrachloroethylene also received from 2.5 to 5 cc. of 10 percent copper sulfate to stimulate closing of the esophageal groove, and no sheep given tetrachloroethylene showed any signs of dizziness or coma.

The apparatus found most efficient consisted of a tightly covered 4-gal. cream can drained by a short piece of pipe. A length of heavy rubber tubing connects the can with a two-way T valve, which in turn is connected with a glass-barreled syringe and the metal esophageal tube. A Shikles valve may be substituted for the T valve in administering tetrachloroethylene, but was found to jam repeatedly with commercial suspensions of phenothiazine. A 40- or 60-cc. glass-barreled syringe was found superior to either a steel or leather plunger 2-oz. dose syringe. The method of administration is described and is said to make possible the handling of 200 sheep per hour.

Enterotoxemias infecciosas de los ovinos juvenes en Colombia [Infectious enterotoxemias in lambs in Colombia], E. S. SCHULTZE F. and R. CAICEDO A. (*Rev. Med. Vet. [Bogotá]*, 14 (1945), No. 89, pp. 65-69).—*Clostridium septicum*, *C. perfringens* (probably *D. oritoxicus*), *C. oedematiens*, and *C. gigas* are reported as having been encountered in Colombia for the first time as causative agents of anaerobic enterotoxemias in lambs. They resembled the enterotoxemias known in other countries as bradshot, braxy, and pulpy kidney.

On the etiology of abscesses in goats, H. J. STAFSETH, C. S. BRYAN, and L. NEU. (Mich. Expt. Sta.). (*North Amer. Vet.*, 27 (1946), No. 1, pp. 22-25).—An organism tentatively identified as *Corynebacterium ovis* is described as causing abscesses in goats, but with no indication of severe systemic reactions during their formation. Experimental infection of two cows with rather large doses produced abscesses of the same nature and a severe systemic reaction.

A clinical and laboratory study of spontaneous listerellosis in a goat, M. M. KAPLAN and A. E. LAGER (*Middlesex Vet.*, 5 (1945), No. 1, pp. 8-11, 35-36, illus. 2).—A case of spontaneous listerellosis in a goat is described as the first case of animal listerellosis from Massachusetts. The history, clinical observations and laboratory findings, post-mortem examination, histopathological examination, and bacteriological studies are presented and discussed. *Listerella monocytogenes* was isolated from the medulla when examined post mortem, but was not isolated from cerebrospinal fluid taken while the animal was alive.

Virus encephalomyelitis in buffaloes, T. S. SHENG (*Science*, 103 (1946), No. 2672, pp. 344, 346).—A disease among water buffaloes in Szechwan Province, China, locally known as "sze-giao-han" is described which is thought to be distinct from all other known forms of encephalomyelitis. It was found to be transmissible to goats, guinea pigs, and rabbits.

A comparison of the effects of pyridoxine and pantothenic acid deficiencies on the nervous tissues of swine, R. H. FOLLIS, JR., and M. M. WINTROBE. (U. S. D. A. et al.). (*Jour. Expt. Med.*, 81 (1945), No. 6, pp. 539-552, illus. 14).—When pigs were fed diets deficient in pyridoxine or pantothenic acid, ataxia developed and lesions were found in the sensory neuron. In pyridoxine deficiency, degeneration of

⁴ *Jen-Sal Jour.*, 25 (1942), No. 4, pp. 10-11, 30, illus. 2.

the peripheral process of the sensory neuron was the initial and most prominent feature, while chromatolysis was the first evidence of damage to the afferent neuron in pantothenic acid-deficient animals.

A importância do lixo e resíduos alimentares na disseminação da peste suína em São Paulo [The importance of street sweeping and garbage in the spread of swine plague in São Paulo], J. MOREIRA (*Biológico*, 11 (1945), No. 10, pp. 259-265, illus. 6).—Existing practices are described and improvements suggested for diminishing the danger of spreading infection through these materials.

Xenodiagnóstico na habronemose dos equídeos: Estudo das larvas do helminto [Xenodiagnosis of habronemosis in horses], J. F. DE SALES and J. JANSEN (*Mem. Inst. Oswaldo Cruz*, 42 (1945), No. 1, pp. 207-215, illus. 6; *Eng. abs.*, p. 215).—In 87 horses examined from July to November 1944, xenodiagnosis for habronemosis was 96.6 percent positive. Measurements and drawings of the larvae are presented, but identification could not be made.

Neoplastic lymphadenopathies in dogs, E. BOND (*Middlesex Vet.*, 4 (1945), No. 3, pp. 91-94, illus. 7).—Leukemias and tumors of the lymphoid tissue as they occur in dogs have been differentiated by histologic studies and examinations of the peripheral blood. The tumors of the lymphoid tissue are classified into those resulting from leukemias and those resulting from neoplasia of the organs themselves.

The relation of immunity in rabies to the antibody content of the serum, F. B. SCHWEINBURG (*Middlesex Vet.*, 5 (1945), No. 1, pp. 3-5, 34-35).—It is concluded that the immunity resulting from antirabic treatment is not due to antibodies in the blood or tissues, but that substances responsible for the state of immunity are different from rabicidal antibodies.

Deformity of the tongue associated with amino acid deficiencies in the chick, C. R. GRAU. (Univ. Calif.). (*Soc. Expt. Biol. and Med. Proc.*, 59 (1945), No. 2, pp. 177-178, illus. 1).—"A condition characterized by the folding-back of the tip of the tongue of chicks is described. A deficiency of isoleucine, leucine, or phenylalanine causes this syndrome, whereas deficiencies of protein or of several other amino acids have no effect. Gradual healing occurs about a week after chicks are placed on an adequate diet."

Effect of excessive ingestion of sodium chloride on the chick, with particular reference to renal changes, C. A. KRAKOWER and M. GOETTSCH (*Arch. Pathol.*, 40 (1945), No. 4, pp. 209-219, illus. 8).—Following reports of heavy losses of 10- to 20-day-old chicks, from many parts of Puerto Rico but all receiving a new lot of mixed feed of high salt content, experiments were undertaken to ascertain the effects on chicks of excessive salt intake. It is concluded that "the toxicity of sodium chloride for young chicks under the field and experimental conditions detailed here is to be ascribed to (1) the indiscriminate feeding habits of the fowl, (2) the morphologically different type of renal glomerulus in the fowl as compared with the mammal, which limits the effective area of filtration, and (3) the normally low total plasma proteins and the blood status represented in low hematocrit readings. The basis for the pathologic changes associated with the ingestion of excessive salt is the accompanying huge consumption of water. In view of the fact that birds are limited in their capacity to deal with these large quantities of water in part at least by the aforementioned factors, the early appearance, the persistence, and the progression of the edema are readily understandable. The earliest morphologic compensatory mechanism that is brought into play in order to aid in the elimination of the excess fluid is glomerular hypertrophy with associated new formation of loops and lobules. An extension of this process and cardiac hypertrophy are in the main the two anatomic factors concerned in determining the survival of the bird and its complete freedom from edema despite the increased consumption of water."

An evaluation of the toxicity of certain sulfonamides for young chickens, P. A. MATTIS, S. E. MCKINNEY, E. A. PATCH, and E. L. WILLIAMS (*Poultry Sci.*, 25 (1946), No. 1, pp. 59-64).—Data are presented from which it is concluded that "the administration, for therapeutic purposes, of sulfamerazine or SS2 in a dosage of 1 percent or less of the diet should not give rise to serious toxic manifestations in chickens."

Chick rearing, V-VIII, T. BARTON MANN (*Jour. Agr., Sci. [England]*, 35 (1945), No. 4, pp. 207-235, illus. 8).—These parts continue the series (E. S. R., 93, p. 773).

V. *The influence of diet on epidemic bacillary white diarrhoea (pullorum disease)* (pp. 207-213).—Control of bacillary white diarrhoea could not be obtained by blood testing when foods of about 20 percent protein content were the sole diet of the chicks. The disease was found in broiler chicks fed 20 percent of protein, but not in sister chicks fed crushed oats for the first 72 hr. and a diet of 14 percent protein intake thereafter. The disease also "not only did not occur in sister chicks in which *B[acillus] pullorum* had been demonstrated to be present in one of their number, but also epidemic bacillary white diarrhoea failed to develop despite the lack of hygienic precautions when these chicks had been placed in an uncleaned brooder from which the survivors of a severe epidemic of this disease had just been removed, and when they were brooded adjacent to chicks which suffered severe mortality from the disease, thereby undergoing all the chances of infection by wide dissemination of *B. pullorum* within a small area."

VI. *The bacterial syndrome encountered in epidemic bacillary white diarrhoea of chicks (pullorum disease)* (pp. 214-224).—It is concluded that the bacterial syndrome encountered in epidemic bacillary white diarrhoea of chicks is initially one of invasion by fecal type organisms, followed by invasion by anaerogenic *B. pullorum*.

"Evidence is presented to show that ostensibly pure cultures of anaerogenic *B. pullorum* consist of two organisms, a true aerogenic *B. pullorum* in symbiosis with an anaerobe, morphologically of the *welchii* type. Evidence is presented to show that variation in fermentation reactions of ostensibly pure cultures of anaerogenic *B. pullorum* depend upon the degree of symbiosis exerted between the anaerobe and the aerobe, and this degree of symbiosis is greatly affected by methods of cultivation on solid media. It is proposed that the ovarian blight peculiar to adult hens which are carriers of bacillary white diarrhoea infection is caused by putrefaction of ovarian material in vivo by the activities of a morphologically *welchii* type organism. It is proposed that *B. pullorum* exists in one form only, namely, the aerogenic form, and that this organism is a potential pathogen only."

VII. *The control of epidemic bacillary white diarrhoea* (pp. 225-231).—A feeding test is reported which indicated that a diet conducive to intestinal putrefaction fed to chicks after 14 days from birth initiates an epidemic of bacillary white diarrhoea. Measures for its control, which consist of the detection and removal of reacting hens from a flock by means of a diagnostic and sensitive antigen, are deemed ineffective unless accompanied by an alteration in nutrition for the purpose of reducing intestinal putrefaction. Experiments are cited to show that the agglutination test cannot differentiate between fowls which produce diseased chicks and fowls which produce chicks resistant to disease. Other experiments designed to show that the disease does not arise from infection from a contaminated brooder indicated that "*B. pullorum* as a potential pathogen does not remain viable to an extent that it is able to produce bacillary white diarrhoea in chicks from an incubator or brooder which has held diseased hatches or broods, respectively."

VIII. *The preparation of a sensitive and diagnostic stained antigen for the rapid whole-blood test for bacillary white diarrhoea of chicks* (pp. 232-235).—A method is presented for the preparation of a sensitive and diagnostic stained antigen for the detection of fowls suspected of infection by the organisms found in epidemic bacillary

white diarrhea, together with evidence that an antigen prepared from organisms grown in a medium which provides for the peculiar growth requirements of the anaerobic organism associated with anaerogenic pullorum, is more sensitive than antigens prepared from organisms grown on media which lack these peculiar growth factors. A stained antigen has been prepared which is agglutinated by pullorum antisera in 15 sec. at 4° C. and in 6 sec. at 15°, and which is not agglutinated by normal sera in 5 min.

Effect of streptomycin on avian malaria, A. O. SEELE, C. MALANGA, and J. PIERSON (*Soc. Expt. Biol. and Med. Proc.*, 59 (1945), No. 2, pp. 291-292).—Trophozoite-induced *Plasmodium gallinaceum* infections were established in 50-gm. Single-Comb White Leghorn chicks by an intravenous inoculum of 200,000,000 parasitized erythrocytes per kilogram. The tests for suppressive activity against both trophozoite-induced *P. cathemerium* and *P. lophurae* malaria were performed on 50-gm. Pekin ducklings inoculated intravenously with 500,000,000 parasitized erythrocytes per kilogram. The sporozoite-induced *P. gallinaceum* infections used for the prophylactic tests were established in 50-gm. Single-Comb White Leghorn chicks by the intravenous inoculation of 0.2 cc. per bird of a suspension of sporozoites prepared by grinding 100 infected mosquitoes in 20 cc. of chicken plasma. In all cases the streptomycin was administered as an aqueous solution intramuscularly every 3 hr.

"The effect of streptomycin therapy was judged by parasite counts made on the fifth day in the *P. cathemerium* experiment and on the eighth day *P. lophurae* experiment. Parasite counts on the trophozoite-induced *P. gallinaceum* infection were made on the fifth day, while the counts on the sporozoite-induced infection were made on the ninth day. The parasite counts were made by determining the number of parasitized erythrocytes among 10,000 erythrocytes on Giemsa stained thin blood smears. Streptomycin at a dose as high as 400,000 units per kilogram per day showed no suppressive activity against *P. cathemerium*, *P. gallinaceum*, or *P. lophurae* infections. The partially purified streptomycin used in these experiments did, however, have a slight effect on the sporozoite-induced *P. gallinaceum* infection. While the group of birds on each dose level was so small that the differences among the average parasite counts are not in themselves significant, the linear relationship between the dose of the drug and the parasite count is noteworthy."

Poultry disease diagnosis chart, with suggestions for prevention and treatment, S. ERIKSEN (*Poultry Tribune*, 51 (1945), No. 11, pp. 18-19).—This chart deals with the diagnosis in 49 cases, arranged by age groups.

AGRICULTURAL ENGINEERING

A new portable field water meter and new furrow water meter, C. N. JOHNSTON. (Calif. Expt. Sta.). (*Agr. Engin.*, 27 (1946), No. 1, pp. 29-31, illus. 6).—An easily constructed, accurate instrument for practical and research application is described. Detailed sketches for construction and calibration procedures are given. A recorder unit or head with a case for a standard domestic water meter selling for about \$3.50 is the only item that need be purchased if a small amount of wood or sheet metal is on hand.

A new priming valve for portable siphons, C. N. JOHNSTON. (Calif. Expt. Sta.). (*Agr. Engin.*, 27 (1946), No. 1, pp. 31-32, illus. 1).—A useful easily constructed starting device for siphon sizes from 2 in. through 4 in. is described. A special adaptation of the valve, constructed of suitable size, could replace the multiple canvas sleeves now being used to seal larger diameter siphons. Stationary siphons having no water seal at the discharge end can also be started by preseating

the valve seat disk prior to priming operations. A detailed construction sketch with materials list is given.

Operation efficiency and factors affecting operations at the Elizabeth Joint Meeting plant, W. RUDOLFS and E. P. DECHER. (N. J. Expt. Stas.). (*Sewage Works Jour.*, 18 (1946), No. 1, pp. 66-81, illus. 2).—Studies made of the operation records for the past 7½ yr. maintained for the Joint Meeting trunk sewer and treatment plant serving 11 municipalities with an aggregate population of 360,000 show that though sewage flow and sludge production has increased about 30 percent, with an average volume around 37 million gal. per day, the percentage purification has remained fairly constant. There was no direct relation between total annual rainfall and sewage flow or purification. Sewage strength remained fairly constant, varying only during prolonged wet or dry periods. Amounts of pollutional matter increased with sewage flow producing greater volumes of settled sludge. Average annual degree of purification by settling varied from 65.8 to 69.7 percent removal of suspended solids and from 36.6 to 42.1 percent in bacteriological oxygen demand reduction. Sewage strength was stronger and degree of purification higher during the summer months, together with approximately one-third more sludge collected and stored as compared with the colder months. Concentration of stored sludge by decantation effected a decrease of over 36,000 tons of sludge barged during the past 3 yr. even though increased amounts of sludge were collected. Under present operation sewage flow can increase to 45 m.g.d. before revised procedures will be required. Total cost of operation and maintenance of trunk sewers and the treatment plant and of disposal of sludge varied from 37.2 to 40.1 ct. per capita during the past 4 yr., and sludge disposal cost varied from \$4.55 to \$4.73 per ton of dry solids barged.

Design of sewers to facilitate flow, T. R. CAMP (*Sewage Works Jour.*, 18 (1946), No. 1, pp. 3-16, illus. 7).—A brief review of some of the important considerations in the hydraulic design of sewers. Discussion is given of the functions of sanitary sewers, a determination of their size, self-cleansing velocities, sewer transitions, and sewer junctions.

Installations for noting the water and thermal relationships in soils, R. G. WHITE. (U. S. D. A.). (*Agr. Engin.*, 27 (1946), No. 1, pp. 21-25, 32, illus. 6).—The author gives a detailed description of the apparatus and the time synchronizing circuits which have been installed at the Michigan Hydrologic Research Project to study the effect of land use on the hydrology of farmland under varying types of snow cover and frozen soil. It is reported that with this installation it has been possible for one man with an average time requirement of 2 to 2½ hr. each day to collect data on the amounts of precipitation, water and erosion losses, soil moisture, air temperature and humidity, soil temperatures at predetermined levels, solar and sky radiation, and wind movement. This record does not, however, include time to clean or adjust equipment, clean silt boxes, or to process or analyze data.

The home mechanic's handbook: An encyclopedia of tools, materials, methods, and directions (*New York: D. Van Nostrand Co.*, 1945, pp. 804+, illus. 790).—Information is assembled for a variety of practical work about the home and in the home workshop. Detailed operations for the following are given: Painting and decorating, by D. J. Di Bernardo (pp. 1-100); woodworking (pp. 101-251), and metal working (pp. 253-404), both sections by R. E. Haines, J. V. Adams, R. Van Tassel, and R. L. Thompson; plumbing, by J. G. Miller (pp. 405-509); masonry, by K. H. Bailey (pp. 511-648); and electricity, by J. F. Nowak (pp. 649-790).

Utilization of nonpetroleum fuels in automotive engines, J. T. DUCK and C. S. BRUCE (*Jour. Res. Natl. Bur. Standards [U. S.]*, 35 (1945), No. 6, pp. 439-465, illus. 20).—Substitute fuels and blends were tested to determine their relative efficiency in the operation of common types of engines. The fuels used were (1)

190-proof alcohol; (2) 200-proof alcohol; (3) acetone; (4) *n*-butanol (normal butyl alcohol); (5) Blend No. 1 (50 percent acetone and 50 percent butanol); (6) Blend No. 2 (67 percent butanol, 27 percent acetone, and 6 percent ethanol); (7) Blend No. 3 (71.5 percent butanol, 28.5 percent acetone); (8) Blend No. 4 (20 percent diethyl ether and 80 percent of 190-proof alcohol); (9) various low-proof alcohol blends varying from 70 to 180 percent; and (10) gasoline. The tests showed that the maximum power developed with alcohol and with some of the other fuels was slightly greater than with gasoline. The specific fuel consumption with the various fuels was approximately in inverse proportion to the heat of combustion of the fuel used. Analysis showed that the mixture distribution was less uniform with the substitute fuels than with gasoline. Tests made with low-proof alcohols showed that an engine can be operated on blends as low as 70 proof, but it is ordinarily impractical to use a blend much below 190 proof because of the excessive volume required.

Digester gas for automobiles, K. IMHOFF (*Sewage Works Jour.*, 18 (1946), No. 1, pp. 17-25, illus. 5).—Sanitary engineers have had broad experience in digesting and gasifying organic matter in municipal sewage treatment plants. In Germany, methane produced by such digestion has been proved to be a good substitute for gasoline as an automobile fuel. The gas is ordinarily carried in steel cylinders at 200 atmospheres pressure, but it may be stored in bags which are not under pressure.

The quantity of digester gas produced at municipal sewage treatment plants is small in comparison with the demand for gasoline, but can be increased enormously if solid organic wastes such as stable manure are digested. The quantity of gas available from the stable manure of one cow is more than 100 times the per capita gas production of typical municipal sewage treatment plants. The author illustrates the design of a rural gas works which is to operate on a farm having 50 cows, 10 calves, 8 horses, and 15 pigs. He estimates that the daily quantity of fresh wet stable manure, including straw, produced by these animals would be 2,500 kg. (650 kg. dry) and would give a daily gas production of 162 m.³ (5,720 cu. ft.) of gas containing 60 percent methane, which is equivalent in heat value to 107 l. (28 gal.) of gasoline. The residues from the stable manure digestion may be used as fertilizer. There is no appreciable loss of fertilizer constituents over those associated with present methods of application of fresh fertilizer to land, as the methane is produced only from that part of the manure that would otherwise decompose in the manure pile or on the fields.

It is thought that rural digester gasworks may become important sources of automobile fuel for Germany and some other countries.

Michigan State College reforestator, T. D. STEVENS and L. E. BELL (*Michigan Sta. Quart. Bul.*, 28 (1945), No. 2, pp. 107-110, illus. 2).—A tree-planting machine which enables two men to field plant 10,000 trees in 8 hr. has been developed. The "Reforestator" is built on a standard farm implement uni-carrier with power lifts and consists essentially of a rolling coulter, a right and left 12-in. moldboard plow, a specially designed easily demountable trencher, two packing wheels carrying an operator's seat, and two galvanized planting boxes each of a size which will hold 1,000 3-year-old coniferous transplants. The reforestator has been used successfully on a number of soil types, but is most effective on sands and loams, or any soil friable enough to flow around the tree roots. Adjustments in the elevations of the two rubber-tired wheels enable planting operations on the contour on slopes up to 30 percent. Rapid mobility is a feature in that it can be trailed behind a tractor or automobile. Power needed to operate is about equivalent to that required for a two bottom plow. Blueprint drawings are being made, to be available for a nominal fee.

The mechanical features of farm dehydrators, B. D. MOSES. (Calif. Expt. Sta.). (*Agr. Engin.*, 27 (1946), No. 1, pp. 14-16, 32, illus. 5).—A dehydrator is a mechanical device, and its limits follow definite mechanical laws which if correctly applied produce the proper results. There is a definite correlation between the fruit to be dried and the heat and air to dry it, also a correlation that controls hydrator design and its operation. The author discusses the fundamental laws of evaporation and the laws which hold for centrifugal and radial flow fans and blowers, presents heat and mass balance equations which have been developed, and reviews facts about dehydration which are of material assistance in the design of drying equipment.

Modernizing a midwestern farmhouse, C. H. VAN VLACK and R. SIMPSON (*Iowa Sta. Bul.* 178 (1946), pp. 577-596, illus. 18).—A typical example of modernizing, based on the three general points to be kept in mind in modernizing decision, (1) is the house worth modernizing, (2) will the remodeled house be satisfactory, and (3) what will be the cost.

AGRICULTURAL ECONOMICS

[Investigations in agricultural economics at the Ohio Station] (*Ohio Sta. Bimo. Bul.* 238 (1946), pp. 24-27).—A second article (E. S. R., 93, p. 505) on Recent Trends in the Farm Real Estate Situation, by H. R. Moore (pp. 24-26), appraises "some recent tendencies which may determine whether or not land prices and debt structures will get dangerously out of line with the earning capacity of farm land in the post-World War II period." The table of index numbers of production, prices, and income by J. I. Falconer (p. 27) is brought down through November 1945.

What peace can mean to American farmers: Agricultural policy, H. R. TOLLEY ET AL. (*U. S. Dept. Agr., Misc. Pub.* 589 (1945), pp. 41+).—This fourth and last report of the series (E. S. R., 94, p. 386) "deals with problems and possible solutions in the field of agriculture itself." The principal specific objectives assumed to be essential to a farm program in line with national needs and wishes are: Adequate farm and forest production; parity of income for farmers; efficient production and distribution of farm products; parity of services and facilities for rural people; good tenure conditions, with special emphasis on the family farm; and productive farm, range, and forest land. Each of the objectives is discussed. The discussion of the leading problems is treated under the two major headings: If there is full employment, and if there is unemployment. Under a full-employment situation a farm program "will have to include measures for dealing with three types of major problems: (1) Problems of prices, production, and distribution; (2) conservation problems; and (3) problems relating to rural facilities and services. Such measures, moreover, will have different application to different types of farmers and to different regions." Different phases of these three problems are discussed in detail. Under the heading, if there is unemployment, the broadening of the farm program under full employment is discussed, in sections on maintenance of consumer demand, continuing the conversion program, other continuing programs, and supplementary measures.

Nebraska looks ahead: Postwar agricultural problems and proposed programs. (*Coop. U. S. D. A. et al.*). (*Nebraska Sta. Bul.* 380 (1945), pp. 115, illus. 14).—"This report on postwar agricultural conditions in Nebraska is the contribution of this State to a cooperative study initiated by a northern Great Plains agricultural committee which addressed itself during the war to the problems likely to arise in the Plains States in the postwar period and to feasible programs looking toward the solution or alleviation of such problems. Committees from the faculties of the Nebraska Agricultural Experiment Station, the Agricultural Extension Serv-

ice, and from the Conservation and Survey Division of the University of Nebraska, with assistance from other interested groups, participated in its preparation." The following committee reports are included: An Analysis and Synopsis of Postwar Agricultural Conditions in Nebraska, by W. W. Burr, F. Miller, and M. S. Peterson (pp. 8-16); Development and Conservation of Physical Resources, by E. H. Doll, F. Miller, J. Thorp, and M. L. Baker (pp. 17-29); Adjustments in Agricultural Production During Demobilization Period, by F. Miller, D. L. Gross, and J. Thorp (pp. 30-46); Marketing Problems in the Demobilization Period, by H. C. Filley, A. W. Epp, and F. J. Chase (pp. 47-52); Opportunities for Settlement on Land After the War Through Water Development, by G. E. Condra, E. C. Reed, H. Waite, and E. E. Brackett (pp. 53-58); Tenure Problems After the War, by W. H. Brokaw, F. D. Keim, H. C. Filley, and E. Frolik (pp. 59-66); Farm Credit in the Postwar Period, by A. W. Epp, H. C. Filley, W. H. Brokaw, F. D. Keim, and E. Frolik (pp. 67-70); Social Security, by H. C. Filley, A. W. Epp, and F. J. Chase (pp. 71-74); Rural Health Services and Facilities in Nebraska, by H. G. Gould, M. Fedde, R. Loper, and R. Gibbons (pp. 75-83); Postwar Housing and Equipment, by R. Loper, M. Fedde, M. Liston, T. A. Filipi, and F. Atwood (pp. 84-94); Postwar Needs in Nutrition, by M. Fedde, H. G. Gould, R. Gibbons, and R. Leverton (pp. 95-96); Industrial Development and Agricultural Relations, by J. F. Lawrence, H. G. Gould, E. C. Reed, and C. W. Smith (pp. 97-100); Rural Electrification in Nebraska, by E. E. Brackett, F. D. Yung, and L. Larsen (pp. 101-102); Rural Education, by H. E. Bradford and C. C. Minter (pp. 103-113); and Research, by E. H. Doll, F. Miller, and F. D. Keim (pp. 114-115).

Arizona agriculture, 1946: Production, income, and costs, G. W. BARR (*Arizona Sta. Bul.* 202 (1946), pp. 17+, illus. 6).—The production of and income in 1945 from truck crops; beef cattle, sheep, lambs, and wool; cotton; citrus fruits; dairying; alfalfa hay; seed crops; and feed grains and miscellaneous crops are discussed. Tables show for 1945, 1944, and average 1935-44, the cash income from different farm and ranch commodities, prices of different agricultural products in December, and the acreages of principal crops by counties. A brief description of the irrigation development in the State is included.

The 1944 farm business report, B. R. BOOKHOUT and A. H. HAIST (*Michigan Sta. Quart. Bul.*, 28 (1945), No. 2, pp. 131-144, illus. 2).—A financial summary of 1,031 Michigan farm records by type of farm areas (16) is included. Farm earnings in 1944, variations in individual farm incomes, farm investments, size of business, crops, livestock, farm expenses, State and area averages, and the changes on accounting farms, 1935-39 to 1944, are discussed briefly.

Labor incomes averaged \$2,406 in 1944 as compared with \$1,990 in 1943. Michigan prices of farm products declined about 1 percent during 1944. Gross income on the accounting farms increased 14 percent over 1943. Prices paid by Michigan farmers increased nearly 7 percent during 1944. Expenses on the accounting farms averaged 12 percent higher than in 1943. The cooperating farmers farmed 6 percent more land, handled 1 percent more livestock, and accomplished 6 percent more work in 1944 than in 1943. Labor efficiency has increased on these farms 26 percent during the war period.

Some price factors affecting farm adjustment in cotton counties of Tennessee, B. H. LUEBKE (*Tennessee Sta., Agr. Econ. and Rural Sociol. Dept. Monog.* 195 (1946), pp. 44+, illus. 28).—Since 1933, cotton acreage has been generally downward, but yield per acre has increased significantly partly in response to an improvement in prices. For the 63 yr. in which direct comparisons can be made, acreage moved in the same direction as prices of the preceding year 65.1 percent of the time. Inverse relationships between price and acreage occurred most frequently in the 1890's and the 1930's. During the price decline of the early thirties, farmers in-

creased acreage to maintain income; and during the ensuing recovery, yields were increased rather than acreage.

In a 33-yr. comparison of sweetpotato prices with acreage, the relation was positive 18 times. In a 2-yr. price lag comparison, a positive relationship occurred 19 times. Area planted to sweetpotatoes in this period changed an average of 74.2 acres for each 1 ct. change in price per bushel. Erratic acreage-price relationships occurred 4 yr. in a row, 1931-34, and also 1936. There appeared to be a tendency to overplant in all of these years except 1933. Annual fluctuations in acreage of sweetpotatoes are partly influenced by the price of cotton. Sweetpotato acreage moved inversely to that of annual average cotton prices of the preceding year in 15 out of 32 yr. The calculated regression curve shows that sweetpotato acreage decreased an average of 500 acres for each 1 ct. per pound advance in the price of cotton. Graphic multiple correlation analysis indicates that adjustment of sweetpotato acreage to price of sweetpotatoes is closer when the price of cotton is high. Overplanting is more pronounced when cotton is low than is underplanting when cotton is high.

Cost of production and utilization of crested wheatgrass on eastern Oregon wheat farms, H. L. THOMAS, G. W. KUHLMAN, and D. C. MUMFORD. (Coop. U. S. D. A.). (*Oregon Sta. Cir.* 167 (1945), pp. 27, illus. 10).—"This study, started in 1943, included 16,752 acres of crested wheatgrass on 73 wheat farms in Jefferson, Wasco, Sherman, Morrow, and Umatilla Counties. Detailed records of the cost of establishing a stand of grass were completed on 55 farms, and detailed grazing records were completed on 99 fields aggregating 7,994 acres of grass." The area studied, present status of crested wheatgrass in the State, methods and cost of establishing a stand of the grass, and the uses made of it are discussed. The seasonal use of the grass for pasture, the carrying capacity of such pastures as compared with native pastures, and the place of crested wheatgrass on wheat farms are discussed more fully.

The total average cost per acre of establishing crested wheatgrass on summer fallow in 1943 was \$6.94. When planted in stubble without seedbed preparation, the cost per acre was \$3.30. The average rate of grazing for the years 1938, 1943, and 1944 was 0.92 animal unit months per acre. It is estimated that crested wheatgrass yields from two to four times as much grazing as native pasture.

Costs, materials, and practices in growing Irish potatoes on Cumberland Plateau, F. N. MASTERS and C. C. MANTLE (*Tennessee Sta., Agr. Econ. and Rural Sociol. Dept. Monog.* 194 (1946), pp. 59+, illus. 39).—"The purpose of this study was: "To provide farmers, county agents, and other agencies with information concerning the requirements and cost of the various operations in production of Plateau Irish potatoes; also to acquaint those interested with the practices used in their production, harvesting, and storing." Most of the data were secured by the survey method. A total of 99 production records were taken on the Plateau portion of nine counties. "Information concerning size of farm, acres of potatoes, yield, and returns from potatoes was obtained for both 1943 and 1944 crop years. Detailed information regarding production practices was obtained for the 1944 crop year, including amounts of labor, seed, fertilizer, machinery, and equipment; power and workstock; and other requirements, such as methods of harvesting, storing, and selling potatoes." The physical features of the Cumberland Plateau are described. Analyses are made by items of land and material charges; machinery and equipment charges for seedbed preparation, planting, cultivating, spraying and dusting, harvesting, marketing and grading, and storing operation; and labor and power requirements for different cultural, harvesting, and marketing operations.

Information basic to adjustments in rice production in Texas, A. C. MAGEE and C. A. BONNEN (*Texas Sta. Bul.* 676 (1945), pp. 46, illus. 5).—"This bulletin

"deals with production and production requirements, with the effect of changes in production practices, and in turn with the probable effect of these changes on earnings." Data for 1941 were obtained from 66 representative growers in three counties. "This survey included an inventory of the farm business, land use, crop and livestock organization, production and disposal, amounts and costs of hired labor, details concerning farm power, and input requirements for rice and beef cattle production." Data were obtained in 1943 from 44 rice growers relative to the use of combines. Data were also obtained from 15 operators of rice-drying plants. The area is described. Among the topics discussed are land tenure and lease arrangements; systems of farming associated with rice production; normal production and production requirements of rice, and labor and power requirements; production and production requirements of beef cattle on rice farms; cost of tractor work, power, and combining; overhead farm expense; etc. Analyses are made of the effects on earnings and income of size of farm, prices, type of lease, yields, systems of farming, tenure on rice-cattle farms, and method of harvesting.

The author directs attention to the following conclusions: "An annual rice crop of 400 acres is more profitable than either an average-sized crop of 282 acres or a small 180-acre crop. Larger earnings were obtained by tenant farmers under cash rent than under share-crop rent. A yield of about 10 bbl. per acre pays the expenses of making a rice crop but leaves the operator nothing for his labor and management. Yields must be kept above this level to insure profitable production. The 'rice-cattle' system of farming is more profitable than the 'rice' system but requires considerably more capital. Land values were high relative to cash rental rates, and it was more profitable to lease for cash than to own land used for rice and beef cattle production. Farm earnings are increased by combine harvesting and artificial drying as compared to the old method of binding and threshing. Combining reduces harvesting costs and results in less waste in harvesting."

An economic study of the sweet potato enterprise in the north Louisiana upland cotton area in 1943, L. J. FENSKE and J. N. EFFERSON. (Coop. U. S. D. A.). (*Louisiana Sta. Bul.* 395 (1945), pp. 24, illus. 2).—Detailed information on production practices, labor requirements, costs, and returns were obtained in the fall of 1943 from approximately 50 farmers in Bienville and Claiborne Parishes producing sweetpotatoes for the commercial markets. Yield and cost data were also secured for a number of years on sweetpotatoes and other important crops in the area—peanuts, cotton, and corn. The factors affecting sweetpotato yields, storage practices and costs, and marketing are discussed.

Sweetpotatoes produced with horsepower required 122 man and 62 horse hours per acre. With tractor and horsepower, 107 man hours, 25 horse hours, 7 tractor hours, and 5 truck hours were required. With tractor-drawn transplanting machines, 15 hr. of man labor were required per acre as compared with 25 hr. for hand-planting. In 1943, sweetpotatoes returned about 47 ct. per hour for man labor, and the net returns per acre and return for man labor were higher than those for cotton, peanuts, and corn. Under long-time average cost-price relationships, sweetpotatoes are in a strong competitive position compared with cotton, peanuts, and corn. Storage charges in 1942 averaged 8 ct. per crate in farm storage houses.

Cost of producing apples and pears in the Hood River Valley, Oregon, G. W. KUHLMAN, J. H. BLOSSER, and D. C. MUMFORD (*Oregon Sta. Bul.* 429 (1945), pp. 22, illus. 1).—This bulletin supplements Bulletin 420 (E. S. R., 92, p. 850), and reports the estimated costs with average yields (1940-42) and 1943 prices of materials and labor. In the present study data were collected for 33 of the orchards included in the previous study. The analyses made for the apple and pear orchards include land use, capital investment, cost of production by items, fixed and variable costs, and the major production operations.

With 1940-42 average yields and 1943 prices of materials and labor, the average cost of producing apples exclusive of packing-house costs was \$438.91 per acre, or \$1.55 per packed box. The cost for pears was \$363.37 per acre, or \$1.31 per box. Of the total cost for apples, labor constituted 61.6 percent, materials 10.3, general expenses 12.4, depreciation 4.0, and interest 11.7. For pears the respective percentages were 46.5, 16.0, 15.5, 5.5, and 16.5. The average labor requirement per acre was 404 hr. for apples and 252 hr. for pears.

An economic study of peach production in Louisiana, F. D. BARLOW, JR. (*Louisiana Sta. Bul. 398 (1945), pp. 32, illus. 8*).—The extent of the peach industry in Louisiana, the yields, production, prices, marketing practices, and the place of the enterprise in the farming systems of the State are discussed. Using data for 1944 for 31 farms on which peaches were grown commercially, analyses are made using 1944 and 1935-39 prices, of the labor and power requirements and cost of establishing a peach orchard, and for orchards in production and also of the returns from producing orchards.

The cost of developing an orchard at 1944 prices was \$102.39 per acre on farms using tractors, and \$87.93 on farms using mules as the principal source of power. With 1935-39 prices, the costs were \$75.68 and \$60.19, respectively. Approximately 90 hr. of man labor, 18.6 hr. of tractor work, and 23.8 hr. of mule work were required to develop an acre of peaches on tractor farms, and 104.6 hr. of man labor, 1.0 hr. tractor work, and 69.5 mule hours on farms on which mules were the chief source of power. On producing orchards about 115 hr. of man labor, 7.3 tractor hours, and 33.4 mule hours per acre are required on tractor farms, and about 106 man hours, 1.7 tractor hours, and 45 mule hours on mule-operated farms. Average net returns per acre in 1944 were \$196.56 on tractor farms and \$150.54 on mule-operated farms, or at 1935-39 prices and yields \$58.68 and \$44.08, respectively. The average yield per acre in 1944 was 106 bu. on tractor farms and 84 bu. on mule farms, and the average price per bushel was \$2.62. In 1935-39 the yields were 102 bu. on tractor and 80 bu. on mule farms, and the average price per bushel was \$1.09.

Progress in development of a land and timber management program in northeastern Minnesota, A. D. WILSON (*Minnesota Sta., 1944, pp. 46+, illus. 16*).—Part 1, Some History and Problems of Northeastern Minnesota, deals with the development of farming in the area, the discovery of iron ore, the development and decline of the timber industry, the tax situation, tax forfeiture and problems, tax-forfeited land, tax status of land, public indebtedness, problems of education and welfare, etc. The bringing together of facts through land use meetings is discussed. Part 2, Northeastern Minnesota People Study Future Possibilities of Their Land and Timber, shows "what local people think of the outlook and what they propose to do about it." It describes the legislation for land classification, zoning, land exchange, etc., and discusses the need for such laws and the progress being made under them. The further steps needed, how they may be obtained, etc., are also discussed. The timber resources, their future management, public revenue from timberland, sale of stumpage, and other problems are dealt with in a less extensive manner.

Development of the dairy industry in Mississippi, D. W. PARVIN (*Mississippi Sta. Bul. 422 (1945), pp. 52+, illus. 12*).—"This is the first of a series of studies designed to provide a general picture of dairying in Mississippi, to point out problems in milk production and processing, and to provide factual information that should aid in the solution of these problems." The chief sources of data for the present study were the annual reports of all dairy plants since 1929 and of manufacturing plants only, since 1919, filed with the Mississippi Department of Agriculture and Commerce. These were supplemented by the annual reports of the dairy specialists of the Mississippi Extension Service and information from the U. S. Census and

the U. S. Department of Agriculture. The data are tabulated by years (with discussions) to show the status of dairy farming in the State, the historical development of dairy manufacturing plants, butterfat purchased from producers, butterfat and solids-not-fat manufactured, volumes of different dairy products manufactured, fluid milk sales and ice cream produced, the relative importance of different products, etc. The development in different areas of the State, the seasonal variation in milk and butterfat purchases, the relation of seasonal production to plant capacity and efficiency of operation of plants and milk transportation, and the prices paid producers for milk and butterfat and the seasonal variation are also discussed. "No attempt was made to derive or work out possible solutions for problems confronting the dairy industry; however, data have been provided that should point the way to the solution of these problems by trained dairy production and marketing men."

Prospective adjustments in the marketing of dairy products in Michigan, C. M. HARDIN (*Michigan Sta. Quart. Bul.*, 28 (1945), No. 2, pp. 119-130, illus. 8).—Charts and maps are included and discussed showing the production and disposition of milk by farmers in the United States and Michigan, 1924-45; the increased sales of whole milk from Michigan farms by counties, 1939-44; the sales of whole milk and of farm-separated cream from Michigan farms by counties, 1944; comparison of prices, 1935-45, received by members of the Michigan Milk Producers Association in Zone 1 of the Detroit market and those paid by condenseries in the east North Central States; comparison of prices paid by condenseries and the average price paid to Michigan farmers for farm-separated cream, 1935-45; civilian consumption and military and lend-lease purchases of selected dairy products, United States, 1935-39 and 1942, 1943, and 1944; and the utilization of milk in production of selected dairy products in Michigan, 1935-39 and 1942, 1943, and 1944. The possible future demands for fluid milk, evaporated and condensed milk, new dairy products, powdered whole milk, nonfat dry milk solids, cheese, and butter are discussed.

The economics of cotton gin operation, D. G. MILEY and A. L. ROBERTS. (Coop. U. S. D. A.). (*Mississippi Sta. Bul.* 421 (1945), pp. 33+, illus. 2).—This bulletin supplements Bulletin 403 (E. S. R., 92, p. 425) by analyzing the data and presenting the findings for the second year (1944) of the study. The 1944 study included 50 gins in the central part of the State—the area studied in 1943—and 42 additional gins in four counties in northern Mississippi.

The average net profits on ginning operation were approximately \$1,227 for the modern gins, \$399 for average gins, and \$7 for substandard gins. Including the net income from cottonseed, bagging, and ties, the approximate total net profits were \$4,327, \$2,601, and \$1,497 for the respective groups of gins. The average profits per bale on ginning operation for the three groups of gins were 64 ct., 31, and 1 ct. Net income from cottonseed, bagging, and ties increased the total net profits per bale to \$2.25, \$1.99, and \$1.46 for the respective groups. An average of 2.9 hr. of man labor was required to gin a bale of cotton. Size of gin, volume ginned, and efficiency in use of labor, power, and capital were the major factors influencing ginning income.

Marketing and manufacturing margins for tobacco, L. D. HOWELL and W. P. YOUNG (*U. S. Dept. Agr., Tech. Bul.* 913 (1946), pp. 56+, illus. 3).—This report is similar to that previously noted on textiles (E. S. R., 94, p. 268), and deals with the break-down of farm-to-retail price spreads for tobacco and tobacco products into their component charges or costs, and with the possibilities of reducing them. Marketing channels and division of the consumer's dollar are discussed. The main sections deal with marketing margins for leaf tobacco, manufacturers' margins, and wholesalers' and retailers' margins, with subsections under each on the usual practices, charges or costs, items included in margins, means of reducing costs, and importance of reductions in costs. A bibliography is included.

"Estimates of the average distribution of the consumers' dollar for all tobacco products combined show that in 1939 about 11.6 percent went to growers for American tobacco, 3.6 percent for tobacco imported, 1.2 percent to wholesalers of leaf tobacco, 25.2 percent to manufacturers, 36 percent for Federal and State excise taxes, 4 percent to wholesalers of tobacco products, and 18.4 percent to retailers." On the basis of cost items, the average distribution was Federal and State excise taxes 36 percent, salaries and wages 17.8, advertising 4.2, operating profits for all agencies except farmers 10.3, and all other expenses of manufacturing and distributing about 16.5, imported tobacco 3.6, and farm production in the United States 11.6. "Data showing distribution of the consumer's dollar paid for tobacco products may serve as a basis for indicating the relative importance of bringing about increased efficiency and reductions in margins or costs for the various agencies and functions involved. According to these data, margins for marketing leaf tobacco in 1939 amounted to less than 1 percent of the consumer's dollar. Manufacturers' margins amounted to about one-fourth; Federal and State excise taxes, 36 percent; and wholesalers' and retailers' margins combined amounted to more than one-fifth of the retail value of the finished products. A reduction of 10 percent in Federal and State excise taxes, for example, would amount to more than one-fourth of the returns to growers for the American tobacco used. A similar reduction in margins for manufacturers, wholesalers, and retailers would amount to more than one-third of the returns to growers and to almost 5 percent of the costs of the finished products to consumers."

Annual report on tobacco statistics, 1945 (*U. S. Dept. Agr., Prod. and Market Admin., 1945, CS-16, pp. 97+, illus. 1*).—The tenth report of the series (E. S. R., 93, p. 89).

Tractors on upland farms in north Louisiana, L. J. FENSKE and F. D. BARLOW, JR. (Coop. U. S. D. A.). (*Louisiana Sta. Bul. 399 (1945), pp. 30, illus. 1*).—Data on 1944 farming operations, with special emphasis on tractor costs and use, were obtained from 62 farmers who had one or more years' experience with tractors. In the analyses, several groupings were used—size of farm, type of equipment (mule or tractor), size of tractor, etc. The analyses cover machinery inventories; cost of operating mule and tractor equipment, combines, and stationary hay balers; cost of operating 1-plow and 2-plow tractors and keeping work stock; rates of performance of different operations on tractor and mule farms; labor and power requirements and production costs, man-labor hours per acre, returns to labor per hour, etc., for cotton, corn, peanuts, sweetpotatoes, watermelons, oats, soybeans, and lespedeza; and materials used in crop production.

The value of machinery inventories averaged \$2,365 per farm, of which 78 percent was in tractors and tractor equipment and 22 percent in mule-drawn equipment. Annual cost of operating tractor equipment averaged \$160 per farm as compared with \$128 for mule equipment. Tractor operating costs for all tractors averaged \$4.22 per 10-hr. day, ranging from \$3.88 for 1-plow tractors to \$4.87 for 2-plow tractors of 17 or more horsepower. Work-stock costs averaged \$161.12 per head in 1944, or 22 ct. per hour of field work. On an average, three mules were replaced by each tractor purchased. Savings in man labor through use of tractors varied from 25 to 60 percent, depending on the crop and extent of mechanization. Returns to labor for the crops studied were greatest when operations were highly mechanized as compared with mule production methods.

Farm ownership in Louisiana financed under the Bankhead-Jones Farm Tenant Act, W. M. ALEXANDER (*Louisiana Sta. Bul. 397 (1945), pp. 30, illus. 1*).—All the farmers in the five upland cotton parishes and two rice parishes who had Farm Security Administration land purchase loans and were operating their farms as owners were interviewed. Included were 27 white and 10 Negro farmers in the cotton area and 38 white and 2 Negro farmers in the rice area. Analyses are

made of size of farms purchased, prices paid and cost of improvements, relation of credit used to value of farms, total investment in real estate and operating capital, progress in paying for land, gain in net worth of farms, and characteristics of tenant purchase families.

The tenant purchase borrowers used borrowed funds to pay 98.1 percent of the total cost of the farms in the cotton area and 93.8 percent in the rice area. "When payments made from all sources of income are included, the 1943 operators in the cotton area had paid 168 percent of the amount due according to schedule to December 31, 1943, and in the rice area 152 percent. In the cotton area, 6 farmers were on schedule with their payments, 12 were ahead, and 19 were behind, while in the rice area 14 were on schedule, 22 were ahead, and only 4 were behind. With few exceptions, those who had not paid up to schedule had valid reasons, and were expected to become current within a reasonable period. The borrowers in the upland cotton area who had been operating their tenant purchase farms as owners for 5 yr. had made an average gain in net assets of \$379 per year, those operating for 4 yr. had made an average gain of \$438 per year, those operating for 3 yr., \$514, and those operating for 2 yr., \$733. The 5-yr. owners in the rice area had gained \$1,732 per year, the 4-yr. owners \$1,498, the 3-yr. owners \$2,093, and the 2-yr. owners \$1,781. . . . As a whole, the tenants purchasing farms by means of FSA loans prior to 1943 had progressed on the road to debt-free farm ownership, and most of them should be able to complete the payments on their farms in due time."

Oklahoma farm real estate activity, 1941-1944, R. T. KLEMM and E. C. FORD. (Coop. U. S. D. A.). (*Oklahoma Sta. Bul.* 291 (1946), pp. 36, illus. 3).—Data regarding farm real estate sales were gathered quarterly each year in eight sample counties representative of the major types of farming areas in the State, and are summarized and discussed for each of the sample counties and for the State as a whole. The discussion covers the price of farm land, volume sold, types of sellers and buyers, intent of buyers, and method of financing sales, including types of lenders, owner's equity and mortgage debt, and mortgage debt retirement.

Capital needed to farm in the Midwest. (Coop. 12 expt. stas., U. S. D. A., et al.). (*Minnesota Sta. Bul.* 389 (1946), pp. 34, illus. 2).—"The purpose of this report is to present information as to the capital needs of various types of farming in the Midwest, methods of using available capital most effectively, and the sources of capital to which farmers have access." It is prepared by a subcommittee of the North Central Regional Land Tenure Committee as North Central Regional Publication No. 5 (E. S. R., 93, p. 361). Tables based on data from records for 1937-40, inclusive, of farm management workers in 11 Midwestern States show by farm types and States the average investment and net cash income; number and size of farms, amount of livestock, and labor used; and the investment, adjusted to 1945 basis. The debt-paying ability of midwestern farmers, how to estimate capital needs and income for a farm, how the way the farm operator gets started in farming influences capital needs, and borrowing to obtain capital are discussed. Suggestions to prospective farmers are included.

Report of the Manager of the Federal Crop Insurance Corporation, 1945, J. C. WRIGHT (U. S. Dept. Agr., *Fed. Crop Ins. Corp. Rpt.*, 1945, pp. 25).—This is the report to the Secretary of Agriculture for the fiscal year ended June 30, 1945. "The corporation was in a liquidating status during approximately the first half of the fiscal year. An amendment to the Federal Crop Insurance Act, approved December 23, 1944, placed the corporation in active operation again. In 1945 the corporation insured spring-planted crops of wheat, flax, and cotton on a Nationwide basis and corn and tobacco on a trial basis in a limited number of counties. This report deals primarily with the revived activities of the corporation rather than with the liquidating activities during the early part of the fiscal year. In

the report, emphasis has been placed on the changes that were made in the crop-insurance program, some as a result of the amendment to the legislation and some as a result of administrative action." Financial reports included consist of a comparative balance sheet and a comparative statement of administrative and operating expenses for the fiscal years ended June 30, 1944, and 1945, and a summary by years of the administrative and operating expenses since the organization of the corporation.

Organizing a farmers' cooperative, S. D. SANDERS (*U. S. Dept. Agr., Farm Credit Admin. Cir. C-108, rev. (1945), pp. 44+, illus. 1*).—This revision (E. S. R., 81, p. 725) discusses the items that should be considered in a survey to determine the conditions under which the association is to operate and some of the factors that should be reflected in the articles of incorporation and bylaws. Suggested organization forms—organization and marketing agreements, articles of incorporation, bylaws, minutes, revolving-fund certificate, etc.—and the Federal Capper-Volstead Act authorizing associations of producers of agricultural products are included.

Farmer's stake in price control, W. W. ARMENTROUT (*West Virginia Sta. Spec. Cir. 1 (1946), pp. 6*).—The author concludes: "During the next year or two the farmer stands to gain much more from price controls than he stands to lose. If price controls are generally removed at an early date, as many interested parties are urging, the farmer stands to lose much of his wartime savings by having to pay inflated prices for the things he will need to buy."

RURAL SOCIOLOGY

Farm Security Administration services (*U. S. Dept. Agr., Sec. Agr. Rpt., 1945, pp. 107-113*).—"The Farm Security Administration's program of services to low-income farmers has operated in a depression period and in a period of high employment with heavy demand for farm products. . . . The FSA started as a subsistence program. Gradually it evolved during the prewar years into a plan for orderly rehabilitation of worthy but impoverished farm families with an ultimate goal of family-farm ownership. When the war suddenly expanded the farmer's markets and drained off much of the surplus manpower among low-income rural families, FSA's program of credit backed by practical on-the-farm planning and guidance provided a basis for increasing food production on the family-type farm. It enabled many small farmers to produce at nearer the full capacity of their available manpower and land resources. . . . Because of the rising real estate market, extreme care is taken in the tenant purchase program to avoid the dangers of inflationary land prices. Loans are made only to applicants who can find good land for sale at prices in line with earning-capacity values as computed on the basis of long-time average prices for farm products. Careful appraisals are emphasized more than ever before, to make sure that only sound buys are approved."

Finnish farmers in Michigan, J. F. THADEN (*Michigan Sta. Quart. Bul., 28 (1945), No. 2, pp. 90-96, illus. 1*).—At present, 63,671 of the 284,290 Finns and persons of Finnish parentage (one or both parents born in Finland) in the United States live in Michigan, 42,520 being native-born of foreign or mixed parentage. Four-fifths of them reside in Upper Michigan, where the topography, climate, and woodland are so similar to those of Finland that the transplanted Finn feels quite at home.

Where most of the Finnish farmers live, the major cash crop is generally potatoes. Hay is another important crop, and more than half of the farm is usually in tillable pasture. The major livestock enterprise is dairying, but one-half of the farmers have a small poultry flock.

Farms are small, averaging 78 acres in eight predominantly Finnish counties, or less than the State average of 96.2 acres. In general, the soils are of a relatively low or medium fertility and sandy. The growing season is short—90 to 130 days. Farms classed as "noncommercial" (those on which farm products used by the farm household are the major source of income) make up 53 percent as compared with the State average of 29. Low farm income compels many of the farmers to supplement their income from other sources, 49 percent working off their farms in 1939 as compared with 32 percent for the State.

Cooperative enterprises are important, with nearly half of the business of the supply co-ops made up of groceries and dry goods and the remainder of gasoline, oil, hardware, feed, and dairy products. Those at Pelkie and Hancock each have an annual business of approximately a quarter of a million dollars.

There are 108 Finnish churches in the State. At least six newspapers and church papers are published for those who read Finnish.

In the eight predominantly Finnish counties only 64 percent of the farms have automobiles, compared with 82 percent in the State as a whole; 48 percent have their homes lighted by electricity as compared with 71 percent for the State; and only 7 percent have telephones as compared with 28 percent for the State. In 1938, the Rural Electrification Administration brought light and electric power to 2,066 farm homes in the counties of Alger, Baraga, Houghton, and Ontonagon, and to Delta and Menominee farms.

Back of many a Finnish house is the Sauna or bathhouse where the bather gives himself a steam bath by throwing water on heated stones. One section of this bathhouse, in many instances, serves as a dressing room and on wash days as a laundry room.

The Finns as a group rate high in literacy, and school attendance on the part of farm children tends to be relatively high. Many county and township offices are held by Finns, but, in general, they are underrepresented in proportion to their number in the predominantly Finnish counties. Adaptations to their physical and changing occupational environments are being made gradually and successfully, and the contribution of Finns to the cultural heritage of rural Michigan is deemed considerable.

Brazil: People and institutions, T. L. SMITH (*Baton Rouge: La. State Univ. Press, 1946, pp. 843+*, about 100 illus.).—While spending a year attached to the American Embassy in Rio de Janeiro, the author traveled extensively over Brazil, observing life and the levels of human progress and gathering, organizing, and interpreting data on the demography and social institutions of the country. The book is divided into seven parts, including cultural diversity, the people, levels and standards of living, relations of the people to the land, and social institutions. Included also are a glossary, bibliography, and author and subject indexes.

Population growth and the food demand (*U. S. Dept. Agr., Sec. Agr. Rpt., 1945, pp. 105-107*).—"Basic in the food demand is the size of our population, which is still increasing rapidly. . . . With export demands unchanged and with per capita domestic consumption likewise static, this 8 percent increase in the population would have required an equal increase in food production. Actually, both exports and per capita consumption at home have increased. . . . In the immediate postwar years the birth rate may continue at the relatively high wartime level. One probable cause will be the return of men from the armed forces; another will be the high proportion in our population of women in the early child-bearing age."

A study of the values of living and working in the rural environment.—I, **The construction of rural living opinion scales.** II, **The opinions of young women university students**, W. A. ANDERSON (*[New York] Cornell Sta., Mimeog. Buls. 18 (1946), pp. 44+*; 19 (1946), pp. 23+).—"This is a study of the values of living

and working in the rural environment. It is presented in two parts. *Part 1* is a description of the methods used in the construction of scales for measuring opinions toward 10 major aspects of living and working in the rural areas. The scales developed are included, together with instructions as to how they may be used. . . . *Part 2* describes the opinions of 260 Cornell University students, chiefly young women, concerning living and working in the rural environment as measured by these scales." As a whole these opinions were slightly more favorable than unfavorable.

Attitudes of rural people toward radio service: A Nation-wide survey of farm and small-town people (*U. S. Dept. Agr., Bur. Agr. Econ., 1946, pp. 133+*, *illus. 11*).—This is the report of a survey undertaken at the request of the Federal Communications Commission, and is based on 4,293 interviews in 2,535 rural households between June 11 and July 28, 1945.

It was found that radio has become a highly valued aspect of everyday living in most rural homes which have radios; a highly desired one in most of those homes that do not. Those listeners, both men and women, who listen to their radios a good deal are more apt to value radio highly than are those who listen only a little. Radio is valued by rural listeners for the two great functions it serves—as a source of news and other information and as a source of entertainment and company. News programs are mentioned by an overwhelming majority of rural people who now have radios; much more often than any other type of program. Farm men and women again exceed rural nonfarm people somewhat in their emphasis on the importance of news programs. In general, farm people select the more "serious" programs. News and market reports, hymns and religious music, sermons and religious programs, and farm talks are given high preference by this group. Old-time music is preferred by approximately 50 percent of the men and women of the farm group. There is a strong tendency for those households which have had no radio for 5 yr. or more also to lack the other means of communication—telephones and daily newspapers.

Rural health conditions (*U. S. Dept. Agr., Sec. Agr. Rpt., 1945, pp. 85-87*).—According to this report, "alarming deficiencies in rural health resources are an increasing source of concern to all interested in rural welfare. The number of physicians available to serve the population on farms and in small towns has been steadily decreasing. There are too few dentists, nurses, druggists, health officers, sanitarians, laboratory technicians. Over 1,200 rural counties lack approved hospital facilities. These deficiencies reflect the low medical purchasing power that has existed in the past in rural areas. Associated with them, and with related economic factors, is a heavy burden of preventable illness, unnecessary disability, and premature death among under-served rural people. . . . State Farm Bureaus in some 20 States, mostly midwestern, have enrolled their members in either Blue Cross group hospitalization or hospital and surgical indemnity plans as a benefit of membership. The Grange has followed a similar course in some States. The Farmers Union is exploring prepayment plans for its members, and local units have set up and operate hospitals at Elk City, Okla., and Amherst, Tex."

AGRICULTURAL AND HOME ECONOMICS EDUCATION

Developing home economics leaders, B. M. WATTS. (Wash. Expt. Sta.). (*Jour. Home Econ., 38 (1946), No. 2, pp. 65-68*).—The author divides home economics leaders into "fundamental experts," persons who have obtained doctorates in technical fields, and "rounded home economists," having a bachelor's degree in general home economics and a master's degree in education or home economics, and points out virtues and shortcomings in both groups. The need for the organization

of the resources of college home economics departments for adequate graduate training and possibilities for the unification of research and teaching are emphasized.

Radio handbook for extension workers, C. A. BOND and W. H. ZIPF (*U. S. Dept. Agr., Misc. Pub. 592 (1946), pp. 21+, illus. 24*).—This handbook includes information, suggestions, etc., in preparing and broadcasting programs. It was prepared in cooperation with the Radio Committee of the American Association of Agricultural College Editors and the National Association of Radio Farm Directors, et al. The appendix, prepared by W. L. Kadderly and M. L. DuMars, includes a sample dialog and sample straight talk.

FOODS—HUMAN NUTRITION

Quality in meat and meat products, O. G. HANKINS. (U. S. D. A.). (*Indus. and Engin. Chem.*, 37 (1945), No. 3, pp. 220–223, illus. 1).—The author notes some of the many factors which, taken together, determine the quality of meat, and further points out that the development of adequate methods for measuring characteristics of meat has been and, in certain respects, continues to be a difficult problem. Breeding, age, sex, feeding, rate of growth, and other animal production factors have important effects on quality. Examples, supplemented with a brief discussion of the significance of commercial meat grades, are presented. Of great influence on quality in meat are the following factors: Processing, preservation, and preparation which involve methods of chilling, ripening, curing, smoking, freezing, and freezer storage, dehydration, cooking, and other operations. Significant relations in this respect are discussed in some detail. Emphasis is placed on recent developments, particularly on those involved in the dehydration and freezing of meat.

[**Studies with meat and eggs**] (*U. S. Dept. Agr., Bur. Anim. Indus. Rpt.*, 1945, pp. 3–5, 18, 19; also in *U. S. Dept. Agr., Agr. Res. Admin. Rpt.*, 1945, pp. 51–53, 66, 67).—Progress notes are given on preservation of meat by freezing, storing cured lamb meat, nutritive value of pork protein (*E. S. R.*, 94, p. 686), value of corn, rye, and soybean flours as binders for meat loaf, addition of carbohydrates to improve dehydrated eggs, and retention of vitamins in dried eggs.

Food quality and flavor (*Indus. and Engin. Chem.*, 37 (1945), No. 3, pp. 208–223, illus. 9).—The following papers were presented in this symposium: Quality Control in the Dairy Industry, by E. C. Thompson (pp. 208–213); Volatility in Food Flavor, by E. C. Crocker (pp. 214–216); Flavors in Food Fats, by H. E. Robinson and H. C. Black (pp. 217–219); and Quality in Meat and Meat Products, by O. G. Hankins (pp. 220–223) (U. S. D. A.) noted above.

Retaining nutritive value of fresh produce, W. J. PETERSON. (N. C. State Col.). (*Ice and Refrig.*, 110 (1946), No. 1, pp. 33–34).—This gives a general discussion of original findings on the effect of icing on the retention of nutritive value in a number of fruits and vegetables held for a period of days after harvest. The results, favorable to the icing process, showed that the leafy type of vegetable such as kale, collards, and mustard greens lost ascorbic acid very quickly when not iced, and retained it remarkably well when iced. This was also true of lima beans. Some vegetables such as peppers, tomatoes, cabbage, and snap beans did not benefit from the icing from the standpoint of vitamin retention when compared with these vegetables un-iced, but did benefit from the standpoint of maintaining a fresh-looking marketable product. The blueberries and strawberries tested likewise did not lose ascorbic acid when stored without ice, but spoiled very quickly without it.

The use of discriminant functions in comparing judges' scores concerning potatoes, W. D. BATEN. (Mich. Expt. Sta.). (*Jour. Amer. Statis. Assoc.*, 40 (1945), No. 230, pp. 223–228; abs. in *Michigan Sta. Quart. Bul.*, 28 (1945), No. 2, p. 167).—Tests are described whereby by the use of discriminant functions made up

of scores on four characteristics (desirability of color, texture, flavor, and mealiness) it was found possible to test for significance between boiled potatoes from two States and also to ascertain the ranks of the importance of the characteristics.

Sweet potato gels—something new, G. L. BAKER and C. W. WOODMANSEE. (Del. Expt. Sta.). (*Food Indus.*, 18 (1946), No. 2, pp. 106-107, illus. 1).—Gels were made with the following ingredients: 1.67 parts Carrager (Irish moss extractive containing added potassium salt), 8.33 parts dextrose added to a mixture of 100 parts sweetpotato pulp (previously pressure sterilized and adjusted to 12 percent soluble solids), 16.67 parts corn sugar, 75 parts sucrose, and seasoning (as desired). The mixture, boiled to 65 percent soluble solids, made a gel stiff enough to be sliced. Powdered mixtures were made by combining 7.50 parts sweetpotato powder, 20.0 parts dextrose, 15.0 parts sucrose, 0.75 part Carrager, 0.15 part common salt, 0.10 part cinnamon, and 0.05 part nutmeg. These dry ingredients were mixed, 65 parts water were added, and 15 min. were allowed for soaking. After a slow boiling period of 5 min., the mixture was remade using 100 parts of water. Sweetpotato gels or dehydrated sweetpotato gelling mixtures are suggested as food products rich in vitamins A and C, and are adaptable for a byproduct industry.

Pecans—their nutritive value, M. C. SMITH, H. FARRANKOP, and H. WISEMAN (*Arizona Sta. Mimeog. Rpt.* 73 (1945), pp. 7).—Lots of 13 varieties of Arizona-grown pecans yielded an average 53 percent of edible meat; refuse (shells) ranged from 42 percent in the San Saba variety to 53 percent in the Success and Philomen varieties. Moisture, determined by drying at 128° C. for 20 min. in a forced-draft Brabender semi-automatic moisture determiner, varied little from lot to lot and averaged 2.0 percent. The protein content ($N \times 6.25$) of the 13 varieties ranged from 9.2 to 13.4 gm./100 gm. of pecan meats, and averaged 10.9 gm. fat ranged from 62.3 percent in one lot of the Halberts to 76.2 percent in the San Saba pecans, averaging 71.5 percent for all the varieties analyzed. Carotene, determined by the method of Peterson (*E. S. R.*, 87, p. 7), averaged 0.078 mg./100 gm. Thiamine and riboflavin, determined simultaneously, following in general the method of Conner and Straub (*E. S. R.*, 87, p. 10) with final florescence measurement in a Pfaltz and Bauer Fluorophotometer, averaged, respectively, 0.889 mg. and 0.135 mg./100 gm. Significant differences were not noted for these vitamins in the varieties analyzed. The place of pecans in the human dietary is discussed.

U. S. Army bread—its composition and vitamin retention (*Baker's Digest*, 19 (1945), No. 6, pp. 22-23, 34, illus. 2).—Noted elsewhere (*E. S. R.*, 94, p. 694).

The forty-ninth report on food products and the thirty-seventh report on drug products, 1944, E. M. BAILEY ET AL. (*Connecticut [New Haven] Sta. Bul.* 489 (1945), pp. 429-450).—This report summarizes examinations of foods and drugs submitted by the Dairy and Food Commissioner during 1944. Contaminated and decomposed foods, deceptive packaging, eggs, fats and oils, flavorings, meat products, milk, sprays, and miscellaneous drugs were among the products examined during the year.

Varietal suitability in the dehydration of vegetables, J. S. CALDWELL. (U. S. D. A.). (*Food Packer*, 26 (1945), Nos. 9, pp. 37-38, 54, illus. 2; 10, pp. 55-56, 58, illus. 1; 11, pp. 70-72).—This paper brings together information available on the comparative quality and suitability for dehydration of green or snap beans, lima beans, beets, cabbage, carrots, celery, peas, sweet corn, okra, kale, onions, pumpkin, winter squash, tomatoes, spinach, sweetpotatoes, and potatoes. Many of the studies reviewed were made by the author.

New peroxidase test procedure for dehydrated potatoes to indicate adequacy of blanching. (U. S. D. A.). (*Canner*, 100 (1945), No. 18, pp. 20, 22).—A new test adapted to determine the peroxidase activity in potatoes prepared in accordance with the lower blanching requirement is described here. Although the procedure was

developed to be used only on dehydrated potatoes, modification of the peroxidase test for undehydrated potatoes is also noted. It is based on the intensity of color developed in solution in a specified time by the enzymatic oxidation of guaiacol. The estimation is made by visual comparison of a solution with a set of standards containing $K_2Cr_2O_7$ and $Co(NO_3)_2 \cdot 6H_2O$ in the ratio of 1 to 65; the standard corresponding to the presently recommended tolerance contains 0.040 and 2.60 gm. of these reagents, respectively, per liter of solution.

Dehydration of spinach: Variety as a factor in determining quality, J. S. CALDWELL, B. D. EZELL, C. W. CULPEPPER, M. S. WILCOX, and M. C. HUTCHINS. [U. S. D. A.]. (*Canner*, 101 (1945), Nos. 9, pp. 12-14, 22; 10, pp. 22-24, 26, 32; 11, pp. 20, 22).—Twenty-five varieties of spinach were studied as to their suitability for dehydration. Following a blanching period of 2 to 3 min. at 210° to 212° F., the material was dried to a moisture content of 5 percent in a parallel-current dehydrator at a 175° beginning temperature, reduced to 150° to 155° for finishing. Each variety was then divided for storage in sealed containers containing carbon dioxide and in nonairtight tin cans; both were stored at 32° for an 8-mo. period.

Based on quality factors of the refreshed material, the varieties rated as best were: Harlem Market, Extra Large Leaved Savoy, Gould Round Thick Leaf Savoy, Virginia Savoy, Dreer Reselected Savoy, Long Standing Bloomsdale, Hollandia, Prickly Winter, Flanders Broad Leaf, and Old Dominion. These varieties were poor in quality: Princess Juliana, Improved Long Standing, King of Denmark, Viking, and Northland.

Fresh spinach averaged 6.37 mg. carotene per 100 gm. for 22 varieties; ascorbic acid content for all varieties averaged 82.3 mg./100 gm. The dehydrated materials stored in sealed containers with carbon dioxide showed a carotene content ranging from 1.74 to 4.30 mg./100 gm., while those stored in nonairtight containers contained 1.73 to 4.53 mg./100 gm. Ascorbic acid content of the series of samples stored in carbon dioxide was slightly greater than in the series stored in air, ranging from 0.0 to 18.76 and 0.0 to 12.85 in nonairtight containers. Results showed that blanching periods longer than 2 to 3 min. caused matting on trays, slow drying, and a dark-colored unattractive product; exposure to sulfur dioxide gas was not beneficial.

Dehydration of Montmorency cherries, D. C. ALDERMAN and B. NEWCOMBE (*Michigan Sta. Quart. Bul.*, 28 (1945), No. 2, pp. 97-106).—A series of experimental treatments were made on Montmorency cherries to ascertain the effect of enzyme inactivation prior to dehydration on the color retention and storage life of the dried product. Blanching of cherries in an open steam blancher resulted in color changes and a mushy texture. Hot water blanches of 3 and 4 minutes' duration (135° F.) were the most satisfactory on color and texture retentions; but after a 6 months' storage period, these cherries turned brown. Supplementary treatments, including wetting agents, acids, salts, sugar, and liquid pectin, were used experimentally to determine their effect on the preservation of color. Dehydrated cherries from lots which showed favorable color retention before storage gave a poor dehydrated product after the 6 mo. of storage.

"It is apparent from the results obtained that further investigational work is necessary before dehydrated cherries will be able to compete economically with either canned or frozen cherries in the pie trade."

Dehydration of small fruits, E. M. LITWILLER. (Oreg. State Col.). (*Canner*, 100 (1945), No. 17, p. 23).—Essentially noted elsewhere (E. S. R., 94, p. 536).

Freezing foods for the home, D. E. BRADY, I. D. JONES, and M. L. McALLISTER (*N. C. Agr. Col. Ext. Cir.*, 280 (1945), pp. 23, illus. 15).—The recommendations given here for preparing and processing meats, fruits, and vegetables are based on 12 literature references.

Preservation of orchard fruits by freezing, J. G. WOODROOF. (Ga. Expt. Sta.). (*Va. Fruit*, 34 (1946), No. 1, pp. 105-112).—This is an address presented at the Virginia State Horticultural Society, December 5, 1945.

Fruit varieties suitable for quick freezing, J. H. CLARK. (N. J. Expt. Stas.). (*Food Packer*, 26 (1945), No. 10, pp. 66-67).—Tests were made on the freezing quality of varieties of yellow freestone peaches; white freestone peaches; strawberries; red, black, and purple raspberries; blackberries; dewberries; and blueberries. Tentative ratings of very good, good, medium, below medium, and poor were made for varieties of each of these fruits.

Into the freezer instead of the oven, G. SUNDERLIN. (Purdue Univ.). (*Quick Frozen Foods*, 7 (1945), No. 8, pp. 88-89, illus. 1).—Rolls, cookie, and biscuit doughs, pastry, pies, and cake batter frozen and held at 0° F. for varying lengths of time before baking compared more favorably with freshly mixed and baked products than those baked before freezing. Recipes and directions for freezing these products are given.

Problems concerning frozen foods, J. E. NICHOLAS and N. B. GUERRANT. (Pa. Expt. Sta.). (*Refrig. Engin.*, 50 (1945), No. 5, pp. 417-419, 466, 468).—This review of literature, relating to the stage of maturity, preparation prior to freezing, containers, rate of freezing, storage temperature, and preparation for the table summarizes the fundamental practices of successful food freezing and suggests goals for evaluation of technics in future research efforts.

Vegetables as a source of spoilage bacteria in home canning, C. DUBORD and W. B. ESSELEN, JR. (Mass. Expt. Sta.). (*Jour. Home Econ.*, 37 (1945), No. 4, pp. 221-224).—A study was made of the spore-forming anaerobes and thermophiles present on fresh vegetables, and the effects of washing, washing and blanching, blanching, or holding on the initial number of organisms present. Most of the vegetables studied were picked from local gardens or grown in the region. The bacterial counts varied widely—ranging from 10 to 30,000,000 anaerobes per gram of green beans (10 samples) and from 1 to 1,584,000 thermophiles per gram of sweet corn (8 samples). No positive correlation between bacterial findings and weather could be established. Putrefactive anaerobes, a frequent cause of home-canning spoilage, were only found twice (out of 91 vegetable samples tested). Both washing and blanching reduced the bacterial count of the vegetables—with blanching alone more effective than washing alone. Washing followed by blanching proved most effective. Results of holding or storing the vegetables for a few hours or overnight were variable and inconclusive.

d-Isoascorbic acid as an antioxidant, W. B. ESSELEN, JR., J. J. POWERS, and R. WOODWARD. (Mass. Expt. Sta.). (*Indus. and Engin. Chem.*, 37 (1945), No. 3, pp. 295-299, illus. 3).—"Under the experimental conditions 20 mg. of d-isoascorbic per 100 cc. in grape juice fortified with 50 mg. of l-ascorbic acid per 100 cc. was sufficient to protect the l-ascorbic acid during processing and storage. In the case of the tomato juice 6 mg. of d-isoascorbic acid per 100 cc. was almost adequate to protect the natural l-ascorbic acid in the juice during storage, even under adverse conditions." The ascorbic acid additions to the tomato juice were also effective in preventing changes in color and flavor which occurred during a 5-mo. storage period at 49° C. It appeared to have little effect on the flavor of the grape juice and produced some color change not noticeable to the eye. The addition of 95 mg. of d-isoascorbic acid to a pint of tomato juice resulted in a flavor more characteristic of uncooked tomato juice than of the processed product.

Preventing surface darkening in certain home-canned foods, J. J. POWERS and C. R. FELLERS. (Mass. Expt. Sta.). (*Jour. Home Econ.*, 37 (1945), No. 5, pp. 294-296).—Surface darkening antioxidants, l-ascorbic acid, d-isoascorbic acid, and d-

gluco ascorbic acid were used experimentally to ascertain the minimum amount which would remove all oxygen from trial packs of peaches and pears. The packs of the first series showed that 135 mg. of any one of the ascorbic acids was sufficient to prevent surface darkenings for a 2-yr. storage period. Tablets (containing 64.8 mg. of ascorbic acid) were added to packs of pears, apple sauce, plums, peas, raspberries, beets, and snap beans. At the rate of 129 mg. per pint jar, they were found to eliminate oxidative off-flavors.

Why canned citrus juices deteriorate in storage, D. W. RIESTER, O. G. BRAUN, and W. E. PEARCE (*Food Indus.*, 17 (1945), No. 7, pp. 76-78, 184-192, illus. 6).—Research on canned orange and grapefruit juices was directed toward studying the effects of storage temperatures upon the retention of flavor, color, and ascorbic acid. At a sustained temperature in excess of 70° F., deterioration in these factors was rapid; at 40° storage, the retention increased. In determining quantities of peel oil affecting the quality of canned orange juice, the results of periodic examinations during a storage period of 13 mo. at room temperature indicated the optimum content to be between 0.030 and 0.040 percent. Juice which contained more than 0.050 percent peel oil developed an objectionable terpene flavor within 1 mo. after canning. Dextrose, sucrose, and levulose in ratios of equivalent sweetnesses were added to canned orange juice to determine the effect of the added sugar upon flavor during storage. The sweetened juices appeared to maintain a more desirable flavor after extended storage than did the unsweetened. In studying the effect of deaeration on the flavor of grapefruit juice, it was found that after 14 mo. of storage that there was appreciably little difference between the deaerated and the control samples; however, physical advantages gained in the production, such as increased pasteurizer efficiency and reduced foaming in the filler bowl, appeared practical for commercial use. Evidence indicated that the gradual development of off-flavors over an extended storage period was due to some extent to free oxygen enclosed in the can. Antioxidants (tyrosine, butyl ester of tyrosine, du Pont's L-11-A, *p*-methylaminophenol sulfate, and *L*-ascorbic acid) were added to canned orange juice to ascertain these oxidative changes. In concentrations as low as 500 p. p. m., the butyl ester of tyrosine caused a pronounced off-flavor after 26 days' storage. Flavor changes in juice packed in enameled-lined cans v. plain tins were also considered.

The home pickling of olives, W. V. CRUESS and R. H. VAUGHN (*California Sta.*, 1945, pp. 7).—Working directions are given for processing ripe olives by: (1) Pickling by a one-lye process which will produce olives yellow or brown in color; (2) pickling by a three-lye process which will produce olives brown or black in color; (3) home canning with and without acid; (4) drying; (5) freezing; and (6) salt-curing Greek style. Directions are also given for preparing Spanish-style and Sicilian-style green olives. Precautions to prevent botulism after home canning are listed.

Pressure cooker gauges and food spoilage, E. J. THIESSEN. (Wyo. Expt. Sta.). (*Jour. Home Econ.*, 38 (1946), No. 2, pp. 85-87).—Data obtained from homemakers' records showed that 17 percent of 718 gages were between 0.5 and 1 lb. in error; 24 percent between 1 and 2 lb. More than 35 percent of the cookers tested inadequate pressure and equal percentages reported canned food spoilage of low acid vegetables and fruits. Findings of the survey indicated that gages should be checked once a year—preferably before the canning season starts.

The electronic blanching of vegetables, J. C. MOYER and E. STOTZ. (N. Y. State Expt. Sta.). (*Science*, 102 (1945), No. 2638, pp. 68-69).—Essentially noted elsewhere (E. S. R., 94, p. 533).

The application of electronics to blanching, J. C. MOYER and E. STOTZ. (N. Y. State Expt. Sta.). (*Canner*, 102 (1946), No. 5, pp. 63, 148, illus. 2).—This is a report on the study noted above.

Electronic mold destruction (*Baker's Digest*, 19 (1945), No. 6, p. 35, illus. 1).—

The process described here involves the use of an electronic oven which sends a high frequency current of 5-sec. duration through a loaf of wrapped bread. After 3 weeks of ordinary kitchen storage, mold did not appear on the bread so treated.

Sulphur vs steam blanching of fruits, L. A. HOHL. (Univ. Calif.). (*Quick Frozen Foods*, 7 (1945), No. 6, pp. 38-39, illus. 1).—The author describes two treatments, pointing out their respective advantages and disadvantages, and submits a review of methods of prevention of oxidative changes during processing, freezing, storage, and thawing of fruits.

Sulphur dioxide solution: Preservation for fruits and vegetables, J. G. WOODROOF and S. R. CECIL. (Ga. Expt. Sta. et al.). (*Food Packer*, 26 (1945), No. 10, pp. 48-54, illus. 4).—Essentially noted elsewhere (E. S. R., 93, p. 681).

Control of microbiological food spoilage by fumigation with epoxides, R. WHELTON, H. J. PHAFF, E. M. MRAK, and C. D. FISHER. (Univ. Calif. et al.). (*Food Indus.*, 18 (1946), Nos. 1, pp. 91-93, illus. 2; 2, pp. 84-86, 228, 230, illus. 3).—Experiments were made on the germicidal effects of ethylene oxide, propylene oxide, isopropyl formate, ethyl formate, and "Oxyfume" (20 percent ethylene oxide in ethylene dichloride) on yeasts, molds, and bacteria that attack unsulphured fruits with high moisture contents. It was found that the ethylene oxide-ethylene dichloride mixture at a concentration of 1 cc. per liter completely killed all organisms tested after a 3-hr. exposure at 86° F. Experiments made in large scale runs in commercial plants showed that a mixture of isopropyl formate-ethylene oxide prevented molding and fermentation of figs with a 30 percent moisture for an indefinite time. The nature of the residues left by such fumigants and their possible toxicities is discussed. Possible applications of the fumigation technic as a method of food preservation are evident.

Postwar packages and containers for marketing foods, D. R. FRENCH (*U. S. Dept. Agr., Bur. Agr. Econ.*, 1945, pp. 64+).—New types of containers and packages and materials for their construction as affected by the war and postwar uses are discussed here. It is pointed out that although some standardization has been accomplished by State and Federal laws, wartime conservation regulations brought further temporary standardization which, from the standpoint of economy in marketing, it may be desirable to continue and enlarge.

Apparatus for measuring rate of gas penetration through food-packaging materials, F. R. SMITH and M. KLEIBER. (Univ. Calif.). (*Indus. and Engin. Chem., Analyt. Ed.*, 16 (1944), No. 9, pp. 586-587, illus. 1).—"An apparatus is described for measuring the rate of gas penetration through flexible materials. The apparatus is particularly suitable for determining the rate of oxygen penetration into pouches used for food packaging. The absolute accuracy of the measurements is determined mainly by the accuracy of gas analysis."

Sanitization of institution equipment, W. L. MALLMANN. (Mich. State Col.). (*Jour. Amer. Dietet. Assoc.*, 21 (1945), No. 3, pp. 142-144).—In this address it is pointed out that even if disease-producing organisms were absent, sanitation would still be necessary to reduce contamination hazards in the preparation and serving of food. "Heat is by far the best means of sanitation from the standpoint of convenience, economy, and efficiency. Heat, unlike chemical sanitation, has the property of penetration." Previously unpublished data here presented show that vegetative bacteria are easily destroyed by hot water, and that exposures of 15 to 60 sec. at 150° F. destroy any disease-producing organisms present. The principal compounds for chemical food sanitation are sodium and calcium hypochlorites (chlorinated lime, HTH, Perchloron, B-K powder, and Diversol). Chloramine compounds, more stable than the hypochlorites, may be used in hot water rinses. Principles observed in the application of chemical sterilizers are that (1) 30 sec. be allowed to effect the kill,

(2) a dose of 100 to 200 p. p. m. available chlorine be applied, (3) the warmer the solution, the more rapid the action. Testing cooking utensils for bacteria indicates whether proper results have been obtained.

Sanitation in frozen food locker plants, W. L. MALLMANN. (Mich. State Col.). (*Quick Frozen Foods*, 7 (1945), No. 6, pp. 80-81, 88, illus. 1).—Although sanitation is a necessary part of any food processing plant, it becomes more necessary in frozen food locker plants because fresh food holds microbe populations intact. Food poisoning and spoilage bacteria should be eliminated during the handling subsequent to processing. Plant cleanliness, using heat and the proper cleaning agent, is discussed from the standpoint of methods noted above.

Symposium on nutrition surveys (*Fed. Proc. [Fed. Amer. Soc. Expt. Biol.]*, 4 (1945), No. 3, pp. 252-281, illus. 14).—The papers presented in this symposium deal with technics and findings that characterize outstanding recent nutrition surveys in the United States, and include the following: Introduction, by C. G. King (p. 252); Techniques of Finding Out What People Eat, by H. K. Stiebeling (pp. 253-258) (U. S. D. A.); Developments in Public Health Nutrition Appraisal, by W. Wilkins and W. H. Sebrell (pp. 258-263); Nutrition Studies in the New Orleans Area, by G. A. Goldsmith (pp. 263-268); Microchemical Methods for Nutritional Studies, by O. H. Lowry and O. A. Bessey (pp. 268-271); and Findings on Examinations of Newborn Infants and Infants During the Neo-Natal Period Which Appear to Have a Relationship to the Diets of Their Mothers During Pregnancy, by H. C. Stuart (pp. 271-281).

New developments in nutrition, J. O. HOLMES. (Mass. State Col.). (*Vt. Dairy Plant Oper. and Milk Distrib., Ed. Conf.*, 24 (1945), pp. 99-105).—An address.

Composition of typical Mexican foods, R. CRAVIOTO B., E. E. LOCKHART, R. K. ANDERSON, F. DE P. MIRANDA, and R. S. HARRIS (*Jour. Nutr.*, 29 (1945), No. 5, pp. 317-329).—Assays for carotene, thiamine, riboflavin, niacin, ascorbic acid, calcium, phosphorus, iron, nitrogen, ash, and total solids were made on 112 samples of food from Mexico. The samples, bought in public markets, were packed in wax cartons, shipped frozen in dry ice, and held thus until analyzed. The foods are listed under their Spanish and botanical names, with English names included when known. Data are presented in terms of the food as received or "wet basis." Many of the foods are little known or have not been previously assayed.

Several of these foods, commonly eaten in Mexico, have been found to be exceptionally good sources of minerals and vitamins. Malva, an uncultivated plant tasting like spinach, is rich in calcium, iron, carotene, and ascorbic acid. Charal, an air-dried fresh water fish usually eaten whole, is high in protein and calcium. Quesa de tuna, a cheese-like preparation from the fruit of the prickly pear cactus, is rich in iron and ascorbic acid. Pulque, a fermented drink prepared from maguey cactus juice, provides significant quantities of minerals and vitamins, especially ascorbic acid, when consumed in amounts of 1 pt. or more. Dried chili or chili seeds are rich sources of ascorbic acid. Extensive use of beans as well as sesame seed, guaje seed, peanuts, and piñón nuts can furnish liberal amounts of iron, calcium, protein, and niacin.

The authors emphasize the fact that Mexican food patterns differ widely from those in the United States, and that an adequate diet may be possible without much use of dairy or meat products.

Effect of the war on food habits in Hawaii, K. B. GRUELLE. (Univ. Hawaii). (*Jour. Home Econ.*, 38 (1946), No. 2, pp. 91-94).—Prior to 1941, Hawaii depended upon imports for 70 percent of her food supply. Adult education classes were taught through the work of the territorial nutrition committee, and residents were urged to produce and can more fruits and vegetables, experiment with substitutes, and choose food wisely. Tastes have become more cosmopolitan as a result of the war.

The amino acid composition of proteins, H. B. VICKERY and H. T. CLARKE (Conn. [New Haven] Expt. Sta. et al.). (*Science*, 102 (1945), No. 2653, pp. 454-456).—This discussion presents the plea that data on the amino acid content of proteins be calculated upon the basis of the actual nitrogen content of the protein rather than upon the basis of a hypothetical nitrogen content of 16 percent, as has been the practice of Block and Bolling (E. S. R., 92, p. 753).

The utilization of d-amino acids by man.—II, Cystine, A. A. ALBANESE (*Jour. Biol. Chem.*, 158 (1945), No. 1, pp. 101-105, illus. 1).—This second study of the series, carried on with the assistance of V. Irby, D. L. Wagner, and J. E. Frankston, follows the pattern outlined previously (E. S. R., 92, p. 738).

Urinary output of total N, total S, inorganic S, cystine, methionine, and indican was measured over a 6- to 8-hr. period following ingestion of 2.4 gm. of *l*(—)-cystine or *dl*-cystine. When *l*(—)-cystine was fed, no apparent increase over normal fasting values was observed. The feeding of racemic cystine markedly increased the cystine output (196.8 mg. v. 41.8 mg. over a 6-hr. period). An increase in total S also occurred, but the chemical identity of the substance responsible for this increase was not established. From these results, the authors conclude that from 15 to 25 percent of the *dl*-cystine fed is not utilized by man. The availability of the *d*-amino acids is considered to be a function of two competing processes, "(1) the rate at which the organism can convert the unnatural into the natural variety and (2) the speed with which the respective *d*-amino acids are excreted by the kidney."

Relative effects of casein and tryptophane on the health and xanthurenic acid excretion of pyridoxine-deficient mice, E. C. MILLER and C. A. BAUMANN. (Wis. Expt. Sta.). (*Jour. Biol. Chem.*, 157 (1945), No. 2, pp. 551-562).—A procedure is outlined for the quantitative determination of xanthurenic acid in urine. It involves acidification to pH 2.5, followed by extraction of the chromogen-producing substance in ether-alcohol.

Mice were fed diets containing variable amounts of casein and pyridoxine with or without added tryptophan. The experiments showed that "pyridoxine-deficient mice fed diets containing 60 percent of casein lived only one-third as long as those fed 10 percent of casein. Although pyridoxine restored growth and minimized the excretion of chromogen on both diets, about 3 times as much pyridoxine was required on 60 percent of casein as when 20 percent was fed. Increases in the excretion of chromogen were quantitatively similar whether *l*-tryptophan was fed as the amino acid or as a component of casein. . . . *l*-Tryptophan decreased the survival time of mice deficient in pyridoxine, but not so much as casein of equivalent tryptophan content. . . . Tyrosine or histidine did not affect either the health or the chromogen excretion of deficient mice."

Administration of phenylalanine apparently had no effect on the growth or survival time of the deficient mice but gave rise to a different chromogen, considered to be probably *p*-hydroxyphenylpyruvic or phenylpyruvic acid. Rats fed a series of pyridoxine-deficient diets containing 60 and 20 percent casein exhibited reactions similar to, but less pronounced than, those observed in the mice.

Effect of the ingestion of excessive quantities of choline on the amount in tissues and urine, R. W. LUECKE and P. B. PEARSON. (Tex. Expt. Sta.). (*Jour. Biol. Chem.*, 158 (1945), No. 3, pp. 561-566).—Sheep and dogs were used in these experiments as large amounts of blood were needed for the determination of free choline. Both total and free choline in plasma, liver, kidney as well as choline in urine were determined by the method previously outlined (E. S. R., 93, pp. 249, 531).

In preliminary experiments, sheep fed 10 and 20 gm. of choline chloride excreted about 1 percent of the amount ingested during the following 48 hr. No effect on the free or total choline values in the tissues could be found. Larger doses (40 gm.) fed daily for 6 days produced similar results, with approximately 2.5 percent of the amount ingested being excreted in any 24-hr. period. Similar experiments on dogs

in which 5 gm. of choline were fed daily for a 5-day period gave comparable results, only 0.5 percent of the amount fed being recovered in the urine and no change in tissue values. Urinary nitrogen increased during choline supplementation—the increment being virtually equivalent to the choline ingested.

Betaine hydrochloride given per os was not excreted in urine as choline or betaine.

The effect of chain length of the dietary fatty acid upon the fatty liver of choline deficiency. D. STETTEN, JR. and J. SALCEDO, JR. (*Jour. Nutr.*, 29 (1945), No. 3, pp. 167-170).—Young male rats, on a choline-free diet, were fed each member of the homologous series of even-numbered fatty acids, from butyric to stearic. The fatty acids, in the form of ethyl ester, were fed at a 35 percent level for a 14-day period.

The results obtained indicated that the degree of fatty liver produced increased markedly as the chain length of the dietary fatty acid decreased from 18- to 16- to 14-carbon atoms. Severe fatty livers were not found when the esters of fatty acids of less than 12-carbon atoms were fed.

A fatal myocarditis occurred when ethyl laurate was used, while renal hemorrhage and necrosis was observed in several of the animals fed ethyl caprylate.

Studies on the comparative nutritive value of fats.—VI, Growth and reproduction over ten generations on Sherman diet B where butterfat was replaced by a margarine fat. H. J. DEUEL, JR., L. F. HALLMAN, and E. MOVITT (*Jour. Nutr.*, 29 (1945), No. 5, pp. 309-316, illus. 2).—Previous studies of Deuel et al. (*E. S. R.*, 92, p. 857; 94, p. 686) on the influence of fat on growth and lactation in the rat have been continued. A modified Sherman B diet composed of skimmed milk powder, ground whole wheat, NaCl, and margarine fat in place of butterfat was used. Supplements of lean meat and lettuce were given weekly. The margarine provided adequate quantities of vitamins D and E as well as 12,000 to 15,000 International Units of vitamin A per pound.

The effect of this modified diet upon the reproduction and growth rate in rats is presented. Ten generations in which the lineage was through the first litter and eight generations in which the lineage was through the second litter were studied. The growth rate of the margarine-fed rats exceeded that obtained with animals fed a stock diet. Improvement in growth rate increased with later generations. The authors conclude that "a vegetable fat such as that contained in a margarine can serve adequately in place of butterfat for growth and reproduction on a diet otherwise nutritionally satisfactory."

Citrate metabolism of preschool children. E. R. METCALF and M. L. HATHAWAY. (Cornell Univ.). (*Jour. Nutr.*, 29 (1945), No. 3, pp. 211-218).—Four of the preschool children participating in the ascorbic acid metabolism studies of Meyer and Hathaway (*E. S. R.*, 85, p. 861; 93, p. 231) served concurrently as subjects for citric acid metabolism experiments. Over a 16-week period, the children were fed a controlled diet or the same diet supplemented with either 100 mg. of ascorbic acid, 3.38 gm. potassium citrate, or equivalent amounts of orange juice.

The results showed that on the basal diet, urinary citric acid excretion ranged from 55 to 247 mg. daily or 3 to 13 mg./kg. of body weight. No consistent change in citric acid excretion occurred on the addition of 100 mg. of ascorbic acid daily. Addition of potassium citrate, with or without added ascorbic acid, caused a pronounced increase in citrate excretion (153 to 167 mg. or 7.1 to 8.1 of the added citrate intake). Addition of orange juice corresponding to approximate equal amounts of the potassium citrate supplement produced similar results averaging somewhat lower (63 to 126 mg. excreted or 2.8 to 7.0 percent of the added citrate intake).

The authors conclude that "the increase in citrate excretion on the addition of potassium citrate or orange juice to the diet appears to be related to the rise in alkalinity of the urine rather than to the citrate content of the diet."

The relative absorption and utilization of ferrous and ferric iron in anemia as determined with the radioactive isotope. P. F. HAHN, E. JONES, C. LOWE, G. R. MENEELY, and W. PEACOCK (*Amer. Jour. Physiol.*, 143 (1945), No. 2, pp. 191-197, illus. 2).—Employing the experimental technics previously outlined by Hahn et al. (*E. S. R.*, 82, p. 703; 91, p. 363), the authors have studied the relative uptake of iron by the use of radioactive isotopes. Results showed that in nine human subjects with various clinical symptoms, the ferrous iron salt (ferrous sulfate or ferrous chloride) was much more readily absorbed and utilized than the corresponding ferric salt or ferric ammonium citrate fed under the same conditions. In experiments on 11 dogs, exhibiting an iron deficiency anemia of long duration produced by bleeding, the uptake of ferrous iron was two to three times that of ferric iron. The authors note that individual responses to a given dose of tagged iron are so variable that it is advisable to study the relative utilization of different iron preparations in the same individual to eliminate this source of error.

Dental caries in the cotton rat.—II, Production and description of the carious lesions. J. H. SHAW, B. S. SCHWEIGERT, C. A. ELVEHJEM, and P. H. PHILLIPS. (*Wis. Expt. Sta.*). (*Jour. Dent. Res.*, 23 (1944), No. 6, pp. 417-425, illus. 9).—The methods of production, determination, and description of the carious lesions in cotton rats are reported in detail. The rats were fed the diets previously described (*E. S. R.*, 94, p. 130).

The authors again note that the optimum time for observation occurs after 14 weeks on the experimental diet. Although the number of lesions apparent on the sucrose diet averages from 4 to 10 times as many as found on a stock or dextrin diet, the extent of each carious lesion is approximately the same on either diet.

The Atwater system of calculating the caloric value of diets. L. A. MAYNARD. (Cornell Univ.). (*Jour. Nutr.* 28 (1944), No. 6, pp. 443-452).—In this editorial review, the author has emphasized the reasons why the factors 4-9-4 used by Atwater in his calculations of the caloric value of protein, fat, and carbohydrate are still valid for present day use in this country. The British system of expressing carbohydrate as "available carbohydrate" in terms of their starch equivalent before multiplying by the factor four is discussed and criticized. One of Atwater's original tables is presented showing the percentage of protein, fat, and carbohydrate provided by each food group, the calories calculated by combustion experiments, and the percentage actually available obtained by digestibility experiments. The overall fuel value of 4 for protein was based upon an approximately 60:40 distribution of animal protein averaging 4.25 calories per gram and of vegetable protein averaging 3.55 calories/gm. Where this distribution has been radically changed, due to wartime or other conditions, corrections should be applied. A table is presented showing the factors to be used for certain general food groups. The factor for fat is 9.00 for animal products or animal and vegetable fats, 8.35 for all other groups, which include cereals, pulses and nuts, vegetables (including potatoes), and fruits. The factors for total carbohydrates are 4.1 for 70 percent extraction cereals; 4.0 for vegetables, pulses, and nuts; 3.85 for sugar (sucrose); 3.8 for animal products and 85 percent extraction cereals; and 3.6 for fruits. Protein figures are more variable, being 4.25 for animal products, 3.70 for 70 percent and 3.60 for 85 percent extraction cereal, 3.20 for pulses and nuts, 3.15 for fruits, and 2.90 for vegetables including potatoes.

The author concludes that for international comparisons in which wide differences may exist in the character of the food supply, some modifications from the use of a single set of overall factors are essential. A common or comparable basis for computing caloric supplies is considered necessary—the use of the above figures is considered a possible solution.

The refinement of metabolic calculations for nutritional purposes and the probl. of "availability", A. KEYS (*Jour. Nutr.*, 29 (1945), No. 1, pp. 81-84).—In this editorial review, the author emphasizes the discrepancies which may occur in the concept of availability of carbohydrate or other nutrients. Stress is placed upon more detailed research, especially on quantitative studies in man, before accurate conclusion can be drawn.

The preventive and therapeutic use of vitamins, N. JOLLIFFE (*Jour. Amer. Med. Assoc.*, 129 (1945), No. 9, pp. 613-617).—This is an authoritative discussion of the use and abuse of vitamins.

The ascorbic acid and carotene content of three varieties of sweet potatoes grown in Arizona and their losses during storage, M. C. SMITH, H. WISEMAN, E. CALDWELL, and H. FARRANKOP (*Arizona Sta. Mimeog. Rpt.* 71 (1945), pp. 9).—Three varieties, Nancy Hall, Porto Rico, and Red Velvet, were planted in April and harvested in November. The potatoes were then stored in pits, in a potato house, or allowed to remain in the ground until ready for market. The total ascorbic acid content per freshly harvested potato averaged 46, 39, and 34 mg., respectively, for the Nancy Hall, Porto Rico, and Red Velvet varieties. From 5 to 7 mg. of the total ascorbic acid was in the dehydro form. Pit storage caused progressive loss of ascorbic acid. At the end of the 4 months' period, reduced ascorbic acid values for all three varieties ranged between 15 to 25 mg./100 gm. Total ascorbic acid values ranged from 24 to 28 mg./100 gm. Laboratory storage for 16 days caused proportionately greater losses in relation to the length of storage period, averaging 22 to 30 percent loss on a dry weight basis.

Carotene values were unaffected by storage, but differed widely with the variety of sweetpotato. Carotene values in milligrams per 100 gm averaged 1.31 to 2.62 in the Nancy Hall variety; 4.97 to 5.79 in the Porto Rico variety; and 3.76 to 5.28 in the Red Velvet variety. Wide ranges in values within a single variety were attributed to size of potato, difficulties in sampling, and possible irregular distribution of the carotenoid pigments.

The use of sweetpotatoes as a fairly stable source of ascorbic acid and carotene is recommended. Tabulated data are presented showing the relative value of sweetpotatoes as a source of ascorbic acid and carotene in relation to other common fruits and vegetables.

Cooking losses of ascorbic acid and carotene in large scale cooking (*Alabama Sta. Bien. Rpt.* 1943-44, pp. 18-19).—"In large scale cooking practice, losses of ascorbic acid for different vegetables averaged as follows (in percent): Lima beans 81.0; string beans 74.5; cabbage 76.0; carrots 46.0; cauliflower 44.5; boiled potatoes 50.8; mashed potatoes 47.3; oven-browned potatoes 80.0; spinach 95.8; baked sweetpotatoes 11.0; turnip greens 58.8; and turnip roots 55.6. The use of large quantities of cooking water, which was discarded, and excessive cooking time appeared to be the factors responsible for the high losses.

"Carotene losses were less serious than the ascorbic acid losses."

Ice cream as a source of riboflavin, carotene and ascorbic acid, A. D. HOLMES, J. W. KUZMESKI, C. P. JONES, and F. T. CANAVAN. (Mass. Expt. Sta.). (*New England Jour. Med.*, 234 (1946), No. 2, pp. 47-49).—"The coffee, maple, and vanilla ice cream contained 0.09 mg., 0.12 mg., and 0.09 mg. of carotene and 0.27 mg., 0.26 mg., and 0.26 mg. of riboflavin per 100 gm., respectively. No ascorbic acid was found, probably because of the large amount of air incorporated in commercial ice cream to increase its bulk.

"Comparison of these ice creams with numerous widely used foods shows them to be excellent sources of carotene and riboflavin for the human dietary. The nutritive value of ice cream, however, varies with the nature and amount of the ingredients used and the process of manufacture."

Effects of home freezing and cooking on snap beans: Thiamin, riboflavin, ascorbic acid, M. G. PHILLIPS and F. FENTON. (Cornell Univ.). (*Jour. Home Econ.*, 37 (1945), No. 3, pp. 164-170).—Freshly harvested Tendergreen snap beans were found to average (per 100 gm. fresh weight) 22.6 mg. ascorbic acid, 0.071 mg. thiamine, and 0.140 mg. riboflavin. As the maturity of the beans increased, the ascorbic acid values fell, but the thiamine values rose. In the overmature beans, the seeds contained only half as much ascorbic acid and riboflavin as the pods, but nearly three times as much thiamine (0.991 mg. v. 0.366 mg./100 gm. dry weight).

Blanching in boiling water, preparatory to freezing, caused vitamin losses ranging from 10 to 15 percent. Subsequent chilling losses equaled approximately 5 percent, while no apparent additional loss was sustained on freezing.

After cooking, fresh beans retained roughly 75 percent of the original amount of the three vitamins, while about 20 percent of each vitamin could be found in the cooking water. Both frozen beans and partially defrosted beans (held 1 to 3 hr. at room temperature) showed somewhat greater vitamin losses than the fresh beans, when cooked in comparable amounts of water (ratio of beans to water approximately 1:1). Cooking the frozen products in just enough water to prevent burning (ratio 6:1) produced a more flavorful product with greater vitamin retention. "Keeping the cooked frozen beans warm in a double boiler for 1 hr. over a low flame resulted in a loss of most of the ascorbic acid but no appreciable loss of thiamine or riboflavin."

The mode of occurrence of carotene and vitamin A in human blood plasma, L. M. DZIALOSZYNSKI, E. M. MYSTKOWSKI, and C. P. STEWART (*Biochem. Jour.*, 39 (1945), No. 1, pp. 63-69).—The extraction of carotene and vitamin A from citrated human plasma has been studied in relation to various physical and chemical conditions.

The results show that only small amounts of carotene and vitamin A are extracted by shaking with ether. Over a pH range of 3 to 12, maximum extraction and protein precipitation occur between pH 4-5. The addition of an equal volume of ethanol to the plasma increases the subsequent carotene extraction by ether. The amounts of carotene and vitamin A extracted by ether are reduced in the presence of bile salts. Half saturation of plasma with ammonium sulfate inhibits the precipitation of the vitamins, while three-fourths or full saturation precipitates them with the albumin fraction. Freezing of an ether-plasma mixture at -25° C. increases the amount of carotene and vitamin A extracted by the ether. Aqueous colloidal solutions of carotene react qualitatively like plasma when treated as described above; but important quantitative differences exist. Carotene in aqueous colloidal solution added to normal plasma cannot be extracted by ether. This effect does not occur when denatured plasma is used.

The authors conclude from these experiments that "the evidence is held to indicate the existence of compounds of carotene and vitamin A with protein, the protein concerned being probably, but not certainly, albumin. Denaturation and precipitation of the protein appears to weaken or disrupt the compounds."

The relationship between the weight of young vitamin A-deficient rats and the increase in weight after β -carotene administration, M. C. A. CROSS (*Biochem. Jour.*, 39 (1945), No. 1, pp. 113-115, illus. 2).—No correlation was found between the initial body weight of rats on a vitamin A-deficient diet and the increase in weight resulting from feeding β -carotene.

The nutritive value of the fatty acids of butter including their effect on the utilization of carotene, E. F. BROWN and W. R. BLOOR (*Jour. Nutr.*, 29 (1945), No. 5, pp. 349-360, illus. 2).—Rats were fed a modified Sherman B diet in which the fat component was butter or one of five fatty acid fractions—volatile, low liquid, high liquid, low solid, or high solid fraction. Weekly supplements of vitamin A in

the form of 3 gm. of raw carrot and 1 drop of a vitamin D concentrate were added. Rats fed butter received considerably more vitamin A than the other groups.

Tabulations are made of the relative growth rates, the amounts of vitamin A stored in the livers, the lipide content of the livers, and the lipide content of the feces.

Results showed that poorest growth occurred when the volatile acids were fed. Both liquid acid diets proved equal or superior to the butter diet. The liquid acids were well absorbed, while absorption of the low solid acids was 71.3 percent and of the high solid acids only 42.2 percent. No significant differences could be observed in the lipide content of the livers studied.

"The nature of the fat being absorbed seemed to be of importance in the utilization of carotene from carrot by the rat. The amount of storage of vitamin A in the livers of the rats fed the liquid acid diets was greater than that in the livers of the rats fed the solid acid diets. In the six liquid groups the average amounts of vitamin A stored varied from 125.5 to 152.7 International Units. Corresponding values for the six solid groups ranged from 66.0 to 88.0 I. U."

The effect of the level of protein in the diet on the utilization of vitamin A, M. DYE, I. BATEMAN, and T. PORTER. (Mich. Expt. Sta.). (*Jour. Nutr.*, 29 (1945), No. 5, pp. 341-347).—This report extends the studies of Muelder and Kelly (E. S. R., 88, p. 553) on the effects of dietary factors upon the utilization of vitamin A. Rats were fed a diet of vitamin A-extracted casein, irradiated cornstarch, cottonseed oil, salt mixture, cystine, and baker's yeast. During the depletion period, which averaged 6.3 weeks, an 18 percent casein level was fed. During the experimental period, triads from groups of 24 rats were fed an equicaloric diet containing, respectively, 9, 18, and 36 percent casein, and 0, 1, 3, or 6 International Units of vitamin A per day.

Results showed that "the level of protein had little effect upon the utilization of vitamin A as judged by weight gains, length of the rat, and incidence of foci of keratinized epithelium. The level of vitamin A intake was directly related to rate of gain up to the level of 3 International Units per day regardless of the level of protein in the diet. There were slightly greater gains in weight on the 18 percent level of protein regardless of the level of vitamin A than on other quantities of protein."

Variation in protein intake produced no noticeable effect on the leucocyte count. However, when low vitamin A levels were fed, the total leucocyte count nearly doubled, and the percentage of polymorphonuclear cells increased as the vitamin A intake decreased.

"The teeth did not show a normal midlingual to midlabial dentin ratio until 6 International Units of vitamin A were present in the diet."

The vitamin A potency of creamery butter produced in Minnesota, R. JENNESS and L. S. PALMER. (Minn. Expt. Sta.). (*Jour. Dairy Sci.*, 28 (1945), No. 6, pp. 473-494, illus. 4).—This is a detailed report of a study conducted as part of a national cooperative project on the vitamin A potency of butter and summarized elsewhere (E. S. R., 92, p. 865).

The investigation of human requirements for vitamins of the B complex, A. KEYS (*Jour. Amer. Dietet. Assoc.*, 21 (1945), No. 4, pp. 211-213).—In this report, emphasis is placed upon the inadequacies in our present knowledge of the vitamin requirements of man. The author stresses the fact that most of the evidence used is based upon calculations from animal experimentation, inferences from clinical observations, arguments based on urinary excretions, and population mortality and morbidity records.

Based upon published and unpublished data from the author's laboratory, a tentative list of minimal requirements is presented. Experiments indicate that if previous dietary habits have been adequate, one may eliminate riboflavin or niacin

from the diet for as long as 30 days without producing any functional impairment. The critical intake of thiamine for this period or longer approximates 0.5 to 0.7 mg. per day. The minimal daily requirements, calculated with only a small margin of safety, are tabulated in terms of 3,000 and 4,500 calorie intakes: Thiamine, 0.8 and 1.0 mg.; riboflavin, 1.0 and 1.2 mg.; and niacin, 8 (?) and 10 (?). The author believes that "practical requirements should be defined in terms of time duration, and practical recommendations should be adjusted to the facts of seasonal dietary alterations."

The biological activity of biotin and related compounds, G. A. EMERSON (*Jour. Biol. Chem.*, 157 (1945), No. 1, pp. 127-130, illus. 1).—"Synthetic and natural biotin had identical activity when assayed curatively with rats maintained on an egg white-containing ration. *dl*-Biotin was one-half as active as biotin. *l*-Biotin was inactive when fed at $7\frac{1}{2}$ times the level of biotin. *dl*-Allobiotin was without effect when fed at a tenfold increase in intake over biotin. Diaminocarboxylic acid (corresponding to biotin), *dl*-diamino acid, *dl*-allosediamino acid, and *dl*-epiallosediamino acid were inactive at levels 100 to 250 times that of biotin."

Studies on the activity of synthetic biotin, its enantiomorph, and related racemic forms for the chick, W. H. OTT (*Jour. Biol. Chem.*, 157 (1945), No. 1, pp. 131-133).—In chicks fed a purified diet containing 15 percent dried raw egg white, synthetic biotin was as effective as natural biotin in promoting growth and preventing dermatitis. Both *l*-biotin and *dl*-allobiotin were without activity when fed in amounts ranging from four to nine times as much as the active compounds.

Biological activity of synthetic d,l-desthiobiotin, S. H. RUBIN, L. DREKTER, and E. H. MOYER (*Soc. Expt. Biol. and Med. Proc.*, 58 (1945), No. 4, pp. 352-356, illus. 4).—Results of microbiological assays showed that *dl*-desthiobiotin was 50 percent as active as *d*-biotin for *Saccharomyces cerevisiae*, and approximately one-half as effective as *d*-desthiobiotin in inhibiting fermentation by *Lactobacillus casei*. Biological assays on rats fed dried egg white or succinylsulfathiazole indicated that the activity of *dl*-desthiobiotin was very slight, being only 0.1 to 0.01 percent that of biotin.

The existence of a microbiologically inactive "folic acid"-like material possessing vitamin activity in the rat, L. D. WRIGHT, H. R. SKEGGS, A. D. WELCH, K. L. SPRAGUE, and P. A. MATTIS (*Jour. Nutr.*, 29 (1945), No. 5, pp. 289-298, illus. 1).—Rats were fed a purified casein diet, or a milk powder diet, to which succinylsulfathiazole (SST) was added in varying amounts—0, 1, 2, 5, 10, or 20 percent. These diets had a very low folic acid (FA) content when assayed by the usual microbiological tests. On the casein diet, addition of 2 percent SST was sufficient to produce symptoms of FA deficiency in the rats. The folic acid content in the liver of the deficient rats averaged less than 0.5 $\mu\text{g./gm.}$ of fresh liver. Other deficiency symptoms noted were growth failure, low total leucocyte count, low percentage of granulocytes, and reduced fecal elimination of FA. On the milk powder diet, a concentration of 10 or 20 percent SST was necessary to produce these same deficiency symptoms, while the rats showed normal growth when 1, 2, or 5 percent SST was fed.

Samples of powdered milk were then digested with highly purified enzyme preparations obtained from rat liver, according to the technic of Mims et al. (E. S. R., 93, p. 675). After this treatment, significantly higher values were found for FA in powdered milk—0.48-0.60 $\mu\text{g./gm.}$ v. 0.016-0.021 $\mu\text{g./gm.}$ observed previously.

The authors conclude "that the 'potential FA' of milk, unavailable as such to micro-organisms, is utilizable by the rat. The existence of such potential FA offers an explanation for the apparent discrepancy between the FA content of milk powder found microbiologically and that indicated by the results of growth experiments in rats."

The importance of "folic acid" in rations low in nicotinic acid. W. A. KREHL and C. A. ELVEHJEM. (Wis. Expt. Sta.). (*Jour. Biol. Chem.*, 158 (1945), No. 1, pp. 173-179, illus. 1).—Weanling mongrel puppies 6 to 8 weeks old were used for this study. A purified basal ration was fed, supplemented with halibut liver oil, riboflavin, pyridoxine hydrochloride, calcium pantothenate, and choline chloride. One group of dogs received additional supplements of folic acid concentrate (B_{12} or norit eluate factor). On these diets, marked nicotinic acid deficiency occurred as characterized by: "(1) Drastic loss in weight, (2) anorexia, (3) inflammation of the gums with palatine redness, and (4) bloody diarrhea."

After these symptoms appeared, a 25 mg. dose of nicotinic acid was given by mouth and the growth response noted. Results showed that when folic acid was fed, the nicotinic acid deficiency appeared somewhat sooner, but the response to the 25 mg. dose of nicotinic acid was much greater, the severity of the mouth lesions was lessened, and the dogs could be used repeatedly for the tests. When folic acid was lacking in the diet, the response to nicotinic acid was poor, blacktongue was more severe, a watery eye condition with considerable exudate frequently appeared, and death occurred despite nicotinic acid treatment.

The appearance of the deficiency symptoms as affected by folic acid administration, possible synthesis of folic acid by intestinal bacteria, and relative age of the animals when tested is discussed.

Effect of corn grits on nicotinic acid requirements of the dog. W. A. KREHL, L. J. TEPLY, and C. A. ELVEHJEM. (Wis. Expt. Sta.). (*Soc. Expt. Biol. and Med. Proc.*, 58 (1945), No. 4, pp. 334-337, illus. 1).—Dogs maintained on a synthetic ration low in nicotinic acid and having had one or more attacks of blacktongue were used. They were given 5 mg. of nicotinic acid one week before the experiment began. Five different diets were fed to a small number of dogs: Group 1 (4 dogs) received 60 percent corn grits in place of the sucrose in the diet, and enough nicotinic acid was added to equal a level of 2.0 mg. percent; group 2, (3 dogs) same as group 1 with the nicotinic acid level at 5.0 mg. percent; group 3, (2 dogs) on mineralized whole milk containing approximately 0.7 mg. percent nicotinic acid; group 4, (2 dogs) same as group 1 with nicotinic acid level at 10 mg. percent; and group 5, (1 dog) 36 percent enriched corn grits containing 1.6 mg. percent nicotinic acid for the entire ration.

Results showed that groups 2 and 5 made comparable weight gains, the two dogs in group 4 died before the end of the test, and the best growth occurred in group 3.

The authors conclude that on a diet high in corn, a nicotinic acid level of 5.0 mg. percent in the corn grits is necessary to produce good growth in dogs. Comparable or better growth is obtained at one-third this level with whole milk or synthetic rations.

Corn as an etiological factor in the production of a nicotinic acid deficiency in the rat. W. A. KREHL, L. J. TEPLY, and C. A. ELVEHJEM. (Wis. Expt. Sta.). (*Science*, 101 (1945), No. 2620, p. 283).—Rats were fed a synthetic ration essentially free of nicotinic acid but adequate in the other known vitamins (with the exception of folic acid and *p*-aminobenzoic acid). On this ration, a weight gain of 30 gm. in 4 weeks was observed. Replacement of 40 percent of the entire ration by yellow corn, white corn, or corn grits produced marked growth inhibition with only 13 gm. gain in 4 weeks. Addition of 0.5 to 1.0 mg. of nicotinic acid per 100 gm. of the corn-supplemented ration completely counteracted the growth-depressing action of corn. Addition of folic acid instead of nicotinic acid did not neutralize the depressant effect of the corn. When glucose replaced sucrose in the synthetic ration or when the casein level was increased from 15 to 20 percent, the growth depressing effect of corn was lessened.

Unenriched corn grits containing 0.7 to 1.0 mg. percent nicotinic acid showed a greater inhibitory effect on growth than corn meal containing 2 mg. percent nicotinic acid.

Production of nicotinic acid deficiency with 3-acetylpyridine, the ketone analogue of nicotinic acid, D. W. WOOLLEY (*Jour. Biol. Chem.*, 157 (1945), No. 2, pp. 455-459).—"Typical signs of nicotinic acid deficiency as seen in susceptible species were caused by 3-acetylpyridine when 2 or more milligrams per day were fed to mice. This species was not susceptible to nicotinic acid deficiency produced by the usual dietary means. The signs of the disease were prevented by sufficient amounts of nicotinic acid or of nicotinamide in the ration. 3-Acetylpyridine was regarded as the structural analogue of nicotinic acid in which the—COOH group of vitamin had been exchanged for—COCH₃. In contrast to the results with animals, 3-acetylpyridine was relatively ineffective for the inhibition of growth of microbial species, and in those instances in which inhibition of growth was produced it was not reversed specifically by nicotinic acid. This ineffectiveness against bacteria was not due to the ability of these organisms to inactivate the compound."

A study of nicotinic acid restriction in man, A. P. BRIGGS, S. A. SINGAL, and V. P. SYDENSTRICKER (*Jour. Nutr.*, 29 (1945), No. 5, pp. 331-339, illus. 1).—"Two subjects, both previously treated for pellagra, were fed a restricted diet low in trigonelline and containing only about 3 mg. nicotinic acid per day. This diet, which contained 50 gm. of hominy but no corn, was eaten for 9 weeks by one subject and 42 weeks by the other. Minimal lesions considered characteristic of nicotinic acid deficiency were apparent at the start, but no significant changes appeared during the course of the experiment. The nicotinic acid excretion of both subjects remained essentially the same at the end of the study as at the beginning. Trigonelline excretion decreased rapidly for about 3 weeks and then stayed at a low level comparable to the nicotinic output for the remainder of the restricted diet period. The fluorescent substance F₂ could not be detected throughout the experiment. Results of niacin tolerance tests were interpreted to indicate a mild state of deficiency. The authors suggest that under their experimental conditions, either because little corn was fed or intestinal biosynthesis of nicotinic acid occurred, the 3 mg. of nicotinic acid supplied daily provided an intake somewhat near the minimal niacin requirement of man.

A comparison of the nutritive value of dextrose and sucrose and of the effects produced on their utilization by thiamine hydrochloride, C. P. RICHTER and K. K. RICE (*Amer. Jour. Physiol.*, 143 (1945), No. 3, pp. 336-343, illus. 3).—"Two-month old rats were fed a diet in which sucrose or dextrose provided the sole source of nourishment. Average survival times were 37 days in both cases. Addition of thiamine hydrochloride (0.02 percent solution) increased the survival times to 56 and 74 days, respectively. The rats on the sucrose diet developed vitamin A deficiency sooner than rats on the dextrose diet. After elimination of vitamin A deficiency, no appreciable differences in growth rates, activity, or survival time were apparent in the two groups of rats.

Vitamin-C content of potatoes, I, II, L. H. LAMPITT, L. C. BAKER, and T. L. PARKINSON (*Jour. Soc. Chem. Indus., Trans. and Commun.*, 64 (1945), No. 1, pp. 18-22, illus. 2; pp. 22-26, illus. 2).

I. Distribution in the potato plant.—Investigations were carried out on several varieties of potatoes, and assays were made on the various parts of the potato plant (flower, leafy parts, stems and stalks, roots, stolons, and tubers) as well as the potato itself (peel, inside, and sprouts). Old and new potatoes were studied directly after harvesting and after various periods of storage in the dark, daylight, and ultra-violet light at 3°, 20°, and 31° C.

No significant difference was observed in the vitamin-C content of the peel and tissue unless the condition of storage induced sprouting, in which case the concen-

tration of vitamin C in the sprouts and surrounding eyes was greater than in the remainder of the tissues.

Results also showed that mincing of the raw potato tissue produced a rapid loss of ascorbic acid (approximately 60 percent in less than 20 min.). "The highest concentration of vitamin-C was found in the leaves, which, together with the new tubers, contributed the bulk of the vitamin C present in the plant. The concentration of vitamin C in the new tubers showed a tendency to increase with time of growth and to reach a maximum shortly before the normal harvesting time."

II. *The effect of variety, soil, and storage.*—"A survey of the vitamin-C content of potatoes sold to the public over a period August, 1943, to the following July was made by drawing samples at monthly intervals of five varieties grown commercially from four districts in England and Scotland, the initial samples during harvesting and later samples from clamps. The average concentration of vitamin C in the raw potatoes declined steadily from 0.3 mg./gm. at the end of August to 0.08 mg./gm. at the end of January and thereafter remained steady at about that level. The only significant varietal difference found was that, during the period of steady decline in vitamin-C concentration, the results for King Edward potatoes were consistently slightly higher than those for the other varieties studied. No significant difference in vitamin-C concentration was found between potatoes of two varieties grown on two different but well-defined types of soil, e.g., black land and silt-land."

The retention of vitamin-C during the "cold-process" preservation of black-currents, S. G. KENDRICK and A. W. E. DOWNER (*Jour. Soc. Chem. Indust., Trans. and Commun.*, 64 (1945), No. 5, pp. 145-147, illus. 1).—Attempts were made to preserve black currants by adding to the fresh fruit varying proportions of bisulfite solution containing from 2,200 to 3,150 p. p. m. of SO_2 . Bottles and Kilner jars were used for small-batch experiments and 40-gal. casks containing 3 cwt. of black currants and 10 gal. of preservative were used for the large-scale tests.

The mean ascorbic acid content of 27 samples of fresh black currants was 195 mg./100 gm. Results of the preserving tests showed that during a storage period lasting over 300 days, ascorbic acid losses were less than 10 percent in the large-scale preparations. Losses ranged from 20 to 30 percent in the small-scale tests. A proportion of preservative solution of at least 23 percent with an SO_2 content of 700 p. p. m. or higher was needed to prevent fermentation and spoilage during storage.

The authors indicate that the ascorbic acid losses incurred by this method of preservation approximate those found in normally stored black currant sirup.

Tangerines—their ascorbic acid content and factors affecting it, M. C. SMITH, E. CALDWELL, and H. WISEMAN (*Arizona Sta. Mimeog. Rpt. 72* (1945), pp. 7+).—Dancy and Algerian varieties of tangerine were simultaneously assayed for vitamin A values (E. S. R., 94, p. 274) and ascorbic acid; results from over 400 assays for the latter are here reported. The effects of variety, position on the tree, seasonal changes, and rootstock on the ascorbic acid content of tangerine segments have been tabulated. In the Dancy variety, the ascorbic acid content ranged from 16 to 65 mg. (average 34 mg.) per 100 gm. edible portion; in the Algerian variety, the range was from 32 to 91 mg. (average 54 mg.) per 100 gm.

As was previously found for oranges (E. S. R., 92, p. 868), highest ascorbic acid values for tangerines were noted consistently in the fruit picked from the south or west sides of a tree. Fruit from the center, north, or east part of the tree had about 25 percent less ascorbic acid. Fruit left on the trees 2 to 4 mo. after reaching maturity showed a slight fall in ascorbic acid content—more noticeable in the Algerian than in the Dancy variety. The influence of rootstock on the ascorbic acid of tangerines of the same variety was noted. Algerian tangerines grown on rough lemon rootstock contained less ascorbic acid than similar fruit grown side by side on sour orange rootstock.

Flavor and ascorbic acid retention in fresh Florida citrus juices, E. L. MOORE, C. D. ATKINS, E. WIEDERHOLD, and L. G. MACDOWELL. (U. S. D. A. et al.). (*Jour. Home Econ.*, 37 (1945), No. 5, pp. 290-293).—Hand-reamed and machine-reamed orange and grapefruit juices, stored covered and uncovered at room temperature for 3 days, retained 97 percent of their original ascorbic acid content. Covered juices, held in cold room storage, showed a better retention of flavor than did the juices stored uncovered at cold room or room temperatures. Ascorbic acid retention was not appreciably influenced by either method of extraction. The results of the determinations made indicated that the length of time fruit juices may be allowed to stand before use in the home is limited by loss of palatability and the beginning of fermentation, not by ascorbic acid losses.

The nature of some new dietary factors required by guinea pigs, D. W. WOOLLEY and H. SPRINCE (*Jour. Biol. Chem.*, 157 (1945), No. 2, pp. 447-453).—The studies of Woolley (E. S. R., 88, p. 705) and Woolley and Sprince (E. S. R., 93, p. 659) have been elaborated in an effort to identify further the three new growth factors required by guinea pigs. The procedures described by Woolley were employed in a series of experiments in which the following results were noted:

"The dietary essential GPF-2, previously demonstrated to be required by guinea pigs, was replaceable by a mixture of cellulose and casein or cellulose, arganine, cystine, and glycine. The optimal amount of casein for growth of guinea pigs fed a highly purified ration was found to be 30 percent of the diet. The dietary essential GPF-1 was identified with folic acid, and the behavior of guinea pigs on a folic acid-deficient ration was described. A highly purified diet for the assay of the unidentified nutritional essential GPF-3 was developed. Some improvement in survival time of GPF-3-deficient animals was observed when biotin and *p*-aminobenzoic acid were fed. It was shown that GPF-3 was not precipitated by lead acetate, was not readily adsorbed by norit, and that while it was insoluble in alcohol it was soluble in alcohol and HCl. It resembled streptogenin, an unidentified growth factor required by certain bacteria."

TEXTILES AND CLOTHING

Flow characteristics of dispersions of cotton and regenerated cellulose rayon fabrics in cuprammonium: Their significance in fluidity calculations, W. C. JELINEK. (U. S. D. A.). (*Indus. and Engin. Chem., Analyt. Ed.*, 16 (1944), No. 3, pp. 172-178, illus. 8).—Flow-pressure and fluidity-velocity gradient graphs were used to determine the flow properties of cuprammonium dispersions of cellulose fabrics and to evaluate the method of calculating the fluidity values. The limits of application of the kinetic energy and velocity gradient adjustments were determined for cellulose-cuprammonium dispersions under experimental conditions very similar to those recommended by the American Society for Testing Materials. The viscometer and buret consistometer were compared in the fluidity technic.

Fading of colored textiles, A. H. TAYLOR (*Illum. Engin. Soc. Trans.*, 41 (1946), No. 1, pp. 35-38).—Extensive studies over a period of years on the fading of colored textiles, exposed to natural daylight and to various artificial light sources, were concerned primarily with the determination of the relative exposures (footcandle-hours) to produce equal fading of representative textiles. As a result of the extensive tests, the following conclusions are considered as representative for the average of all specimens tested: (1) The fading of a colored textile is approximately proportional to the exposure in footcandle-hours for a particular light source; (2) atmospheric humidity has little influence on the rate of fading; (3) the rate of fading is about the same for exposures at 85° and 120° F., but is appreciably increased by raising the temperature to 150°; and (4) fading produced by natural daylight is caused chiefly by energy of wave lengths shorter than approximately $\lambda 6,000$. Exposures of 108 colored textiles to natural daylight (combined sunlight

and skylight), tungsten-filament lamps, and fluorescent daylight lamps gave the following average relative exposures in footcandle-hours to produce equal fading: Sunlight and skylight 1.00, tungsten-filament light 1.81, and fluorescent daylight 1.68. Exposures of a few colored textiles to a germicidal lamp, radiating most of its energy at $\lambda 2,537$, caused a much faster rate of fading than comparable exposure to fluorescent daylight lamps. These results, it is pointed out, emphasize the need for care in the installation of germicidal lamps where fading of textiles or other objects may be undesirable. They also indicate the possibility that the lamps might be used for accelerated tests of light fastness.

How to tailor a woman's suit, M. SMITH (*U. S. Dept. Agr., Misc. Pub. 591* (1946), pp. 24, illus. 65).—Simplified tailoring technics (pressing, fitting, cutting, interfacing, undercollar, etc.) are presented with directions accompanying illustrations.

HOME MANAGEMENT AND EQUIPMENT

Farm incomes and living costs for certain Kansas families, M. A. GUNSELMAN (*Kansas Sta. Bul. 327* (1945), pp. 35, illus. 7).—This study of Kansas farm family income and expenditure is based on data taken from the farm and home account books kept by 346 farm families during 1934–40. These families were classified into groups according to family type—type 1 including those families consisting of husband and wife only; type 2, husband and wife and 1 or 2 children less than 16 yr. of age; type 3, husband and wife and 1 child 16 yr. of age or older with or without up to 3 other children; type 4, husband and wife, at least 1 child who was less than 16 yr. of age, and 2 to 5 other children regardless of age; and type 5, 5 to 14 members, consisting of husband and wife and 3 or more other adults, or a husband and wife and 5 or more other persons regardless of age.

The farms operated by these families varied in size from 94 to 8,012 acres—the average size being 464 acres, with 57 percent of the land under cultivation. Nearly 60 percent of the families owned all or a part of the land operated.

Net farm incomes varied from \$958 in 1938 to \$2,057 in 1935 during the 7-yr. period. Six percent of the annual records showed a loss, and 22 percent showed incomes above \$2,500. In most of the years, type 5 had the largest net farm incomes, and type 1 averaged the lowest with the exception of 1935, although the author believes that there was no consistent relationship between the size of the family and the size of the net farm income.

Analysis of the annual records revealed definite similarities in the patterns of spending for the groups studied, although the total value of the items used in family living varied with the size and the composition of the family. Families in type 1 averaged an expenditure of \$992 annually for all consumption items, whereas the average expenditure for families in type 5 was \$1,696; families in type 3 spent \$78 more on consumption items than the average family in type 5; the money value of food, household operation, and medical care for families in type 4 was more than for the same groups on items for families in type 3. The average value of living (including gifts, small savings, and life insurance payments) was \$1,426 for the 7-yr. period.

Pressure cooker gauge testers, A. BARAGAR and M. E. RUNNALLS (*Nebr. Agr. Col. Ext. [Pub.] CC-88* (1945), pp. 4, illus. 7).—Materials for constructing and directions for assembling and using the pump- and tank-type gage testers are given. Both types use air pressure and are modifications of other testers which have been used by county extension agents. In analyzing the data obtained on 710 gages, it was found that 42 percent had an error greater than 1 lb. per square inch, and 20 percent had an error greater than 20 lb. This latter error may be a contributing factor to food spoilage. The testers described here check the gage while it is still fastened to the lid—this is advantageous from the standpoint of the time required to test the gage.

Jar rings for use in home canning: Their testing and a proposed specification, R. H. TAYLOR, H. G. WHEELER, and F. BENEDICT (*U. S. Dept. Com., Bur. Standards Misc. Pub. 181 (1945), pp. 18, illus. 4*).—"Canning tests were made on 20 rings from each of 50 different samples. The rings were analyzed for rubber content, and measurements were made of their tensile strength, ultimate elongation, stress at 100-percent elongation, swelling on processing, indentation by a ring simulating a jar cap, and hardness. The canning failures in tests by the pressure-cooker method bore no relation to rubber content or tensile properties of the rings but were related to swelling, indentation, and hardness, and to the change of these properties with processing. The relation was not exact, because some failures probably resulted from excessive variations in jars and tops. Apparatus was developed for accurately measuring profiles of sealing surfaces. The results of the investigation are expressed in terms of a proposed specification for jar rings."

Composition of some trade name solvents used for cleaning and degreasing, and for thinning paints, A. D. BRANDT, W. J. MCCONNELL, and R. H. FLINN (*Pub. Health Rpts. [U. S.], 61 (1946), No. 5, pp. 132-143*).—The information here presented was obtained in the course of an investigation of acute cases of systemic poisoning among war plant workers using industrial solvents. The solvents, listed by their trade names and including a number of dry-cleaning solvents, are described as to their composition in terms of aromatics; halogenated hydrocarbons; alcohols, esters, ethers, and ketones; paraffins and naphthenes; and other components. The boiling range (degree C.) and the supplier or manufacturer are also listed.

REPORTS AND PROCEEDINGS

Report of the Secretary of Agriculture, 1945, C. P. ANDERSON (*U. S. Dept. Agr., Sec. Agr. Rpt., 1945, pp. 167+*).—This report covers the activities of the Department of Agriculture and of the Food and Agriculture Organization of the United Nations (pp. 15-19). Findings of the State experiment stations are also included (pp. 119-124).

Among the subjects discussed and not noted elsewhere in this issue are food as a weapon of war, the farm reconversion problem, strength of agriculture's production forces, food throughout the world, agriculture's need of world trade, the year's production, cotton and farm economy, what's ahead for wheat, feed-grains problem, dairying, meat animals and meats, fruits and vegetables, fats and oils, poultry and egg products, sugar, the changing wool situation, tobacco, farm income in 1945, the price supports in 1945, agriculture's balance sheet, credit requirements for reconversion years, the rise in farm-land values, farm efficiency and farm opportunity, farm labor, machinery on farms, increasing use of fertilizer, the housing of farm people, distribution problems, our national nutrition, farmer discussion of world-peace organization, surplus-property activities, lag in market facilities, agricultural cooperatives, water policy and agriculture, soil conservation service, improvement of western grazing lands, crop insurance, extension programs, entomology during the war years, research in dairy problems and livestock production, forests and the war, electrification on the family-sized farm, progress with crop plants, and chemistry and crop utilization.

Report of the Administrator of Agricultural Research, 1945, P. V. CARDON (*U. S. Dept. Agr., Agr. Res. Admin. Rpt., 1945, pp. 238+*).—This report includes a discussion of the future of agricultural research, needs in animal research, better feeding of farm animals, expanding uses of farm products, goals in human nutrition, and using results of research. Appended are reports, also issued as separates and noted elsewhere in this issue, of the Bureaus of Agricultural and Industrial Chemistry (pp. 9-47); Animal Industry (pp. 49-98); Dairy Industry (pp. 99-115); Entomology and Plant Quarantine (pp. 117-177); Human Nutrition and Home Economics (pp.

179-190, and Plant Industry, Soils, and Agricultural Engineering (pp. 191-228); and the Office of Experiment Stations (pp. 229-238).

Report of the Chief of the Bureau of Agricultural and Industrial Chemistry, Agricultural Research Administration, 1945, O. E. MAY (*U. S. Dept. Agr., Bur. Agr. and Indus. Chem. Rpt.*, 1945, pp. 39; also in *U. S. Dept. Agr., Agr. Res. Admin. Rpt.*, 1945, pp. 9-47).—The following, among other accomplishments, are reported upon by the Bureau and the U. S. D. A. Regional Research Laboratories: Research to maintain cotton production by development of better tire cords, chemical treatments for cotton fabrics, and utilization of cottonseed and peanut oils; simplified pricing of peanuts; sweetpotato utilization; leaf meals for poultry; riboflavin production from yeast; allyl starch for protein coatings; starch in sponge form; enzyme research to alleviate shortage of malt; fermentable sugars from crop wastes and fiberboard from crop residues; soybean and linseed oils; soybean meal for plywood adhesives; use of itaconic acid for making plastics; vulcanizing recipes for acrylic "rubbers"; casein fractionation and use in bristles; fibers from feathers; increased penicillin yields; tomatin, lysozyme, citrinin, subtilin, tyrothrycin, and gramicidin as antibiotics; commercial extraction of rutin; gluten sulfate manufacture; allergens of eggs and castor-beans; improvement of egg powders, dehydrated vegetables, frozen fruits, canned citrus juices, and production of pectin and apple-flavoring constituents; recovery of citrus byproduct wastes and sugar cane products; reduction of sugar losses in beets in storage by whitewashing; naval stores studies; treatment of leather for mold resistance; production of improved tallow emulsifiers and oleic acid; new nicotine compounds as fungicides; and tests of canaigre, scrub oak bark, and sumac as sources of tanning extracts.

Report of the Chief of the Bureau of Animal Industry, Agricultural Research Administration, 1945, A. W. MILLER (*U. S. Dept. Agr., Bur. Anim. Indus. Rpt.*, 1945, pp. 50; also in *U. S. Dept. Agr., Agr. Res. Admin. Rpt.*, 1945, pp. 49-98).—The research reported is for the most part noted elsewhere in this issue.

Report of the Chief of the Bureau of Dairy Industry, Agricultural Research Administration, 1945, O. E. REED (*U. S. Dept. Agr., Bur. Dairy Indus. Rpt.*, 1945, pp. 17; also in *U. S. Dept. Agr., Agr. Res. Admin. Rpt.*, 1945, pp. 99-115).—The research reported is for the most part abstracted elsewhere in this issue.

Report of the Chief of the Bureau of Entomology and Plant Quarantine, Agricultural Research Administration, 1945, P. N. ANNAND (*U. S. Dept. Agr., Bur. Ent. and Plant Quar. Rpt.*, 1945, pp. 62; also in *U. S. Dept. Agr., Agr. Res. Admin. Rpt.*, 1945, pp. 117-177).—This report notes the progress of research on insect-control devices and methods, tests of DDT, rotenone and other materials, baits and barriers, fumigants, a cotton-mopping mixture, termite and decay preventives, biological control with various parasites, disease-vector studies, development of insect-resistant plants, bee culture and diseases, insect pest surveys, including insects infesting cereal and forage crops, forest and shade trees, and cotton, and of screwworm, control of the Japanese beetle, gypsy and brown-tail moths, sweet-potato weevil, pink bollworm, grasshoppers, mormon crickets, chinch bugs, armyworms and cutworms, white-fringed beetle, pear psylla, Hall scale, mole crickets, dog flies, phony peach and peach mosaic, and Dutch elm disease, barberry eradication, and quarantines against pink bollworm and other pests.

Report of the Chief of the Bureau of Human Nutrition and Home Economics, Agricultural Research Administration, 1945, H. K. STIEBELING (*U. S. Dept. Agr., Bur. Human Nutr. and Home Econ. Rpt.*, 1945, pp. 12; also in *U. S. Dept. Agr., Agr. Res. Admin. Rpt.*, 1945, pp. 179-190).—This administrative report includes data on adjustments of rural families to economic change; income, food consumption, and dietary adequacy; nutritive value of civilian food supply; family food plans; research on nutritive value of foods, especially wheat germ; vitamin A and

carotene; dried eggs for the postwar market; home food preservation; equipment for home freezing; textiles and clothing in wartime; serviceability studies on household fabrics; cotton fabric utilization; making household cotton mildew-resistant; and standards for clothing construction and sizing.

Report of the Chief of the Bureau of Plant Industry, Soils, and Agricultural Engineering, Agricultural Research Administration, 1945, R. M. SALTER (*U. S. Dept. Agr., Bur. Plant Indus., Soils, and Agr. Engin. Rpt., 1945, pp. 38; also in U. S. Dept. Agr., Agr. Res. Admin. Rpt., 1945, pp. 191-228*).—This report summarizes progress results of research in uses of 2,4-D; development of improved corn, wheat, oats, barley, and sorghum; bindweed control by sheep; cotton improvement, fiber measurement, and verticillium resistance; culture of castorbeans and hops; dry-land management and use of shelter belts; design of a grain bin and studies of storage problems; drying peanut vines and hay; corn borer control; improved crimson clovers, vetches, and lespedeza; reduction of sweetclover seed production by clipping; losses by soybean diseases; range and pasture studies; hybrid pearl millet seed; irrigation of Kentucky bluegrass-clover sod; forest pathology, including studies of little leaf disease of pine, control of mold on wood containers, *Fomes annosus* on western pine, and *Fusarium* canker on southern pines; fruit and vegetable crops, including new peach varieties, new sprays for preharvest fruit drop, control of cranberry fruit rots with Fermate, culture of potatoes, pecans, and peanuts, nitrogen fertilizers for tung trees, aerosol technic for colchicine, new strains of lettuce, cantaloups, onions, tomatoes, and potatoes, sulfur dusting for bean rust, control of virus diseases of Easter lilies, use of sterile mica in place of soil for seedlings, and regulation of temperature in tomato shipments; irrigation agriculture, including phosphorus content of irrigated soils, boron concentration in well waters, and green manures in rotations; nematology, including studies of the potato rot nematode and longevity of a nematode in rye; rubber investigations, including studies of guayule, *Hevea*, and *Cryptostegia* spp.; use of nitrogen for corn in North Carolina; soil depletion in North Dakota; sugar plants, including weed control in cane fields and breeding sugar-sorghums and disease-resistant sugar beets; and tobacco, including culture, weed control in plant beds, breeding for wildfire resistance, and dust treatments for blue mold.

Report of the Chief of the Office of Experiment Stations, Agricultural Research Administration, 1945, J. T. JARDINE (*U. S. Dept. Agr., Off. Expt. Stas. Rpt., 1945, pp. 10; also in U. S. Dept. Agr., Agr. Res. Admin. Rpt., 1945, pp. 229-238*).—An administrative report for the fiscal year ended June 30, 1945, including brief notes on the progress of research at the Puerto Rico Experiment Station.

Experiment Station progress in insect and plant disease control, 1945, F. ANDRE, H. P. BARSS, and F. V. RAND (*U. S. Dept. Agr., Off. Expt. Stas., 1946, OES-R1, pp. 32+*).—This is a reprint from the report noted above of the sections on control of insects and plant diseases.

Report on the agricultural experiment stations, 1945, J. T. JARDINE ET AL. (*U. S. Dept. Agr., Off. Expt. Stas., Rpt. Agr. Expt. Stas., 1945, pp. 172+*).—This report consists mainly of a review of progress in agricultural, nutrition, and rural-life research during the fiscal year ended June 30, 1945. The major headings are: Highlights of the Year in Station Research; Increasing Soil Productivity; Producing Field-Grown Food and Feed Crops; Forage, Pasture, and Range; Fruit Production; Vegetable Production; Special Crops; Control of Insects; Plant Disease Control; Weed Control; Better Feeding Practices for Livestock; Increasing Productivity of Livestock; Maintaining Health of Farm Animals; Maintaining Quality of Animal Products; Food and Nutrition Investigations; Economic and Social Adjustments; and Statistics.

Appended statistics show that the total income of the stations for 1945 was \$28,082,086, an increase as compared with 1944 of \$1,139,424, derived entirely from non-Federal sources. Included were Federal-grant funds which totaled \$7,001,208 and non-Federal funds of \$21,080,879, or \$1 of Federal funds to \$3.01 from other sources.

The total number of research workers in 1945 is shown as 4,370, including 2,163 full-time staff members and 2,207 who divided time between research and teaching or extension work. As compared with 1944, there was a decrease of 63 full-time and 92 part-time research workers.

The publications of the stations in 1945 included 722 bulletins, circulars, and reports, 1,741 articles in scientific journals, and 457 miscellaneous publications. In 1944, the comparable figures were 933, 1,753, and 560.

[**Fifty-fourth and Fifty-fifth Annual Reports of the Alabama Station, 1943-44**], M. J. FUNCHES ET AL. (*Alabama Sta. Bien. Rpt. 1943-44*, p. 39).—In addition to a project reported on page 131, notes are given of progress in agricultural economics, including tenant-purchase farms and 1944 losses in peanut harvesting; agricultural engineering, including the dynamics of soil erosion and its control, equipment for dehydration of sweetpotatoes and kudzu, distribution of ammonium hydroxide, sweetpotato production, and grain sorghum cultural tests; agronomy and soils, including the use of nitrogen for peanuts and green-manure oats, lime for peanuts and Caley peas, boron for alfalfa and legume seed production and susceptibility of winter legumes to borax injury, fertilizers for alfalfa, need for magnesium and sulfur, pasture improvement, and cotton breeding; animal husbandry, including grazing kudzu with cattle and hogs, green feed for laying hens, farm poultry management, effect of cottonseed, swine breeding, vitamin A and carotene content of milk and butter, relation of B vitamins, fats, and amino acids to growth of rats, and lathyrism in relation to the use of Caley peas for livestock; cause and control of concealed damage to peanuts; horticulture and forestry, including yields of slash and loblolly pines, growth of wood in young stands and influence of pruning, returns from slash pine in short rotations, response of hybrid sweet corn to intensive methods, cultural and fertilizer studies with sweetpotatoes, nitrogen requirements of sweetpotatoes and sweet corn, sweetpotato flour and its uses, and use of kudzu for terraces and hay; and zoology-entomology, including boll weevil control, fumigation of plants and potting soil with methyl bromide, production of camellia cuttings and fertilizers for camellias, control of the velvetbean caterpillar on soybeans and peanuts and of weevils in stored corn with DDT, management of farm fishponds, and preservation of quick-frozen fish.

Food and Agriculture Organization of the United Nations: Report of the first session of the conference held at the city of Quebec, Canada, October 16 to November 1, 1945 (*Washington, D. C.: Food and Agr. Organ. of the United Nations, 1946*, pp. 89+).—This contains the reports of Commission A (Policy and Program) and Commission B (Organization and Administration), with supplementary data relating to resolutions and recommendations, the budget, rules of procedure, financial regulations, and the constitution.

MISCELLANEOUS

Rocks and rivers, E. W. SHULER (*Lancaster, Pa.: Jaques Cuttell Press, 1945*, pp. 300+, illus. 105).—In this volume, an "effort is made to include the fundamental philosophies of geology but to save them from the maze of technical terms, which, however important to the geologist, are soon forgotten by those who do not follow this profession." Among the 16 chapters are those on soils and on the economic landscape, i. e., mineral resources.

NOTES

Kansas College and Station.—The recent death is noted of Dr. Thomas P. Haslam, assistant professor and assistant in veterinary medicine from 1909 to 1917. He was a graduate of the college in 1908 and received his D. V. M. degree in 1914, as well as an M. S. degree from the University of Kansas and an M. D. from the University of Nebraska. While on the station staff he developed the immunization agent known as blackleg aggressin. At the time of his death he was a practicing physician in Council Grove, Kans.

The resignations are noted of Elmer H. Smith, extension assistant professor in agricultural engineering, Walter M. Carleton, instructor in agricultural engineering, S. W. Decker, associate professor of horticulture, and Charles J. Birkeland, research assistant in horticulture. J. C. Hide, associate professor of agronomy, Glen H. Beck, assistant professor of dairy husbandry, and Wilfred H. Pine and C. P. Wilson, assistant professors of agricultural economics, have returned from military service. New appointments include Richard C. Eaton, research assistant in poultry husbandry, T. J. Claydon, associate professor in dairy husbandry, Ray M. Hoss, assistant professor of agricultural economics, and Harold B. Harper, professor of agronomy.

Minnesota Station.—Dr. Harold Macy, dairy bacteriologist, has been appointed associate director.

New York State Station.—Fred C. Stewart, associated with the botanical work of the station from 1894 until his retirement in 1936, died April 24 in his seventy-ninth year. A native of New York State, he received his B. S. and M. S. degrees from the Iowa College and had studied at Harvard and Cornell Universities and the University of Munich. His service included three years as mycologist at the newly established Long Island substation and the organization and administration of the department of botany and its later successor, the division of plant pathology. A recent tribute from the station notes that he was "the author of more than 200 scientific articles and bulletins and of numerous popular articles. He was also much in demand as a speaker at farmer gatherings. He did pioneer work on potato diseases, particularly virus diseases, and the control measures he developed are still standard practice to a large degree. He also made many contributions in the field of mycology, with special reference to the classification of the wild mushrooms of the Adirondacks."

Walter O. Gloyer, assistant professor of plant pathology, retired June 1 after 34 years' service.

Ontario Agricultural College.—The death in his eighty-first year is noted on February 4 of Henry H. Dean, head of the dairy department from 1891 until his retirement in 1932. A native of Ontario and a graduate from the college in its first class in 1890, he served for a few months at the New York State Station. Following his return to Ontario, he rendered a notable pioneer service in developing the educational and experimental work of the department. In 1893 he established the annual dairy short course, and a few years later the "dairy option" for long-course students desiring to specialize in dairying. Among other writings, he was the author of *Canadian Dairying*, a textbook first published in 1903 and still in use in revised edition.

EXPERIMENT STATION RECORD

Vol. 95

AUGUST 1946

No. 2

RECENT WORK IN AGRICULTURAL SCIENCE¹

AGRICULTURAL AND BIOLOGICAL CHEMISTRY

Base exchange of crystalline silicates, S. B. HENDRICKS. (U. S. D. A.). (*Indus. and Engin. Chem.*, 37 (1945), No. 7, pp. 625-630, illus. 8).—The author presents certain concepts which he holds to be "fundamental for an understanding of base exchange by silicates." Necessary conditions for cation exchange in zeolite structures are the presence of negative portions in the lattice frameworks and of multiconnected channels large enough for ionic migration. The ways in which negative portions of lattices arise in zeolites and clay minerals are discussed in detail. Termination of an ionic lattice at a surface often involves incomplete balancing of charge with a corresponding requirement for presence of external ions. Base exchange capacity of kaolin minerals is due to this factor.

Properties of granular and monocrystalline ammonium nitrate, W. H. ROSS, J. Y. YEE, and S. B. HENDRICKS. (U. S. D. A.). (*Indus. and Engin. Chem.*, 37 (1945), No. 11, pp. 1079-1083, illus. 6).—The authors point out that although such properties of the salt as its hygroscopicity, melting point, solubility, and absolute density are inherent and independent of the manufacturing process, certain properties including moisture holding capacity, caking tendency, crushing strength, and apparent density vary with the size, shape, and porosity of its particles, which vary with the process used in its preparation. This paper presents experimental data on the relation of porosity, size, and shape of ammonium nitrate to its behavior in storage and its drillability in the field. The results show that ammonium nitrate in the form of porous granules of uniform size and shape flows more freely, exhibits less tendency to cake, and has a greater capacity to hold moisture before becoming undrillable than other types of the material which are less porous and more irregular in particle size and shape.

Formic acid content of milk heated to high temperatures as determined by the distillation procedure, I. A. GOULD and R. S. FRANTZ. (Mich. Expt. Sta.). (*Jour. Dairy Sci.*, 29 (1946), No. 1, pp. 27-31).—Formic acid determinations were made by the distillation method on milk to which known quantities of formic acid were added and on milk which had been heated for 1- and 2-hr. periods at 116° C.

From 60 to 71 percent of the added formic acid was recovered by the method used, the average recovery being 66.5 percent. Milk heated for 1 hr. averaged 9.9 mg. of

¹ The publications abstracted in these columns are seldom available for distribution by the Office of Experiment Stations. In general, application should be made to the Office of Information of the U. S. Department of Agriculture, Washington 25, D. C., for publications of the Department; to the directors of the State agricultural experiment stations, as listed on page 3 of the cover of this issue, for publications of the several experiment stations; and to publishers of books and journals for material issued by them. Microfilms and photostatic copies, the latter legible without magnifying equipment, may be purchased from the Library, U. S. Department of Agriculture, Washington 25, D. C. Rates and other details will be supplied by the Library on request.

formic acid per 100 cc. of milk when the retention correction was used. This represented approximately 49 percent of the total titrable acidity increase. In contrast, milk heated for 2 hr. contained a corrected average of 21.8 mg. formic acid per 100 cc. of milk or a concentration equivalent to approximately 57 percent of the total titrable acidity increase.

Preparation of methyl lactate: Continuous alcoholysis of lactic acid polymers, E. M. FILACHIONE, J. H. LENGEL, and C. H. FISHER. (U. S. D. A.). (*Indus. and Engin. Chem.*, 37 (1945), No. 4, pp. 388-390).—The authors note that although the esterification of lactic acid with methanol is troublesome, it is important because methyl lactate can be converted readily into higher lactic esters by alcoholysis or into methyl acrylate by pyrolysis of its acetyl derivative. The present paper describes the preparation (both batch and continuous) of methyl lactate by alcoholysis of lactic acid polymers, a method that for the most part avoids the difficulties encountered when water is present.

Methyl acrylate by pyrolysis of methyl acetoxypropionate: Effect of pressures of 1 to 67 atmospheres, W. P. RATCHFORD and C. H. FISHER. (U. S. D. A.). (*Indus. and Engin. Chem.*, 37 (1945), No. 4, pp. 382-387, illus. 5).—Methyl acrylate was made by pyrolyzing the acetyl derivative of methyl lactate in stainless steel equipment at various temperatures and pressures between 500° and 625° C. and 1 to 67 atmospheres. Moderate pressures had little effect, but lower yields of methyl acrylate were obtained at the higher pressures, primarily because of the formation of the dimer and higher polymers of methyl acrylate. Other byproducts were formaldehyde, acetaldehyde, methyl acetate, carbonaceous material, oxides of carbon, and gaseous hydrocarbons. High yields of methyl acrylate and acetic acid were obtained below 565° under approximately atmospheric pressure. The decomposition of the ester appeared to be a reaction of the first order. Specific velocity constant (sec.⁻¹) is illustrated by the equation:

$$K_1 = 7.8 \times 10^9 \times e^{\frac{-38,200}{RT}}$$

Emulsion polymerization of acrylic esters, W. C. MAST, L. T. SMITH, and C. H. FISHER. (U. S. D. A.). (*Indus. and Engin. Chem.*, 37 (1945), No. 4, pp. 365-369, illus. 4).—Effects of various agents on the emulsion polymerization of acrylic esters are described, and directions are given for preparing several types of resin emulsions. The emulsifying agents specified are, for the most part, commercial proprietary preparations. For the conversion of the monomeric esters into polymers or copolymers of relatively high molecular weight, a specified commercial emulsifier with ammonium persulfate as polymerization catalyst served satisfactorily. The resulting emulsion was only moderately stable and could be coagulated readily by the addition of aqueous solutions of sodium chloride, acetic acid, or mixtures of the two. Another proprietary emulsifier and hydrogen peroxide also could be used conveniently to produce emulsions of only moderate stability. Emulsions remarkably stable to electrolytes (but not to mechanical agitation or solvents such as acetone and ethanol) could be made with still another commercial preparation. Two of these emulsifiers used together in various proportions produced emulsions of almost any desired degree of stability toward electrolytes. Stable emulsions for brushing and spraying were made with various combinations of agents, of which one was composed of an emulsifier, ammonium alginate, ammonium hydroxide, and ammonium persulfate. The viscosity of acrylic resin emulsions could be controlled over a wide range by using various quantities of ammonium alginate, modified casein, and a proprietary emulsifier. Films obtained from these emulsions adhered well to smooth surfaces.

Preparation and reclamation of copper—chromium oxide catalyst, R. E. DUNBAR and M. R. ARNOLD. (N. Dak. Agr. Col.). (*Indus. and Engin. Chem., Analyt. Ed.*, 16 (1944), No. 7, p. 441).—Carborundum aggregates, Celite pellets, and

granular Celite were tested as supporting materials for copper-chromium oxide catalyst, and this combination was found satisfactory for dehydrogenation of alcohols. The usual acetic acid leaching and washing of the catalyst could be omitted if adequate heat treatment at 150° C. was substituted. Copper-chromium oxide catalyst which had become sluggish in its action through prolonged use could be reactivated or reclaimed by heating to expel absorbed organic material and reoxidize the reduced metals. Acetic acid leaching and washing then provided a catalyst as active as the original for the dehydrogenation of alcohols.

Solvent extraction of cottonseed and peanut oils: Boiling point, vapor pressure, composition relations for miscellas of oils in hexane, E. F. POLLARD, H. L. E. VIX, and E. A. GASTROCK. (U. S. D. A.). (*Indus. and Engin. Chem.*, 37 (1945), No. 10, pp. 1022-1026, illus. 6).—The boiling points and densities of mixtures of cottonseed and peanut oils with commercial hexane are reported. They were useful in the design of vacuum evaporators and strippers and for control operations involving temperature, time of heating, and concentration of oil-solvent mixtures of various compositions, to prevent or minimize fixation of objectionable coloring matter or other deteriorative heat effects. Boiling point data are determined at various concentrations of crude cottonseed oil and crude peanut oil, over a range of pressures from 160 to 760 mm. absolute in commercial hexane. The reported data are considered likely to be of value in the further development of the technology of the solvent extraction of vegetable oils. Observations of the effect of agitation in establishing equilibrium conditions of the oil-solvent mixtures were made. The Raoult law and the Dühring rule could not be applied for predicting data of the necessary accuracy within the critical operating region.

Viscosities and densities of solvent-vegetable oil mixtures, F. C. MAGNE and E. L. SKAU. (U. S. D. A.). (*Indus. and Engin. Chem.*, 37 (1945), No. 11, pp. 1097-1101, illus. 6).—A pycnometer and a viscometer suitable for use with volatile mixtures and for low-temperature determinations are described. Density and viscosity measurements were made from incipient crystallization to a temperature near the boiling point of the solvent for the complete binary systems cottonseed oil-commercial hexane, cottonseed oil-acetone, cottonseed oil-2-butanone, peanut oil-commercial hexane, and soybean oil-commercial hexane. From these data it was possible to construct for any of these systems the density-composition and viscosity-composition curves for temperature as well as the density-temperature and viscosity-temperature curves for any composition. The various systems are compared and their idealities discussed. The density-composition curves for the binary systems of commercial hexane with the three oils practically coincided. The viscosity-composition curves for these systems almost coincided up to about 60 percent by weight of oil and then diverged to the values for 100 percent oil. The same was true of the binary systems of cottonseed oil with the three solvents, except that the curves started to converge again at about 90 percent to meet at the 100 percent oil value. The applicability of these data to other random samples of these vegetable oils is discussed.

The action of copper and antioxidants in linoleic acid autoxidation, F. G. SMITH and E. STORZ (*New York State Sta. Tech. Bul.* 276 (1946), pp. 30, illus. 13).—The effects of copper (significant acceleration by concentrations as low as 0.005 p. p. m., maximal acceleration by about 5 p. p. m.), a typical heavy metal catalyst, and several types of antioxidants on linoleic acid autoxidation were studied by measuring the rate of oxygen uptake of aqueous suspensions in Warburg apparatus.

Added copper increased the maximum rate, approximately in proportion to the logarithm of concentration. This catalyst also shortened the induction period and at any stage of reaction immediately caused rates paralleling copper controls. This evidence, together with the results of the contaminating copper in the controls,

pointed to the copper content as the controlling factor in autoxidation rate under these experimental conditions.

The effect of three copper-complex-forming compounds, sodium diethyl-dithiocarbamate, 8-hydroxyquinoline, and cyanide, was investigated both with and without added copper and by addition at various stages of the reaction. The degree of inhibition effected by each of these compounds depended on the concentration of copper and the time of addition.

The inhibitive action of hydroquinone, a typical oxidizable antioxidant, and its corresponding quinone varied less with copper concentration and showed other evidences of difference in mechanism of action from the copper inhibitors. Comparison of the stability of 8-hydroxyquinoline and sodium 2,6-dichlorobenzeneoneindophenol during linoleic acid autoxidation provided further evidence of difference in action of copper inhibitors and oxidizable antioxidants, suggesting that the distinction may be of general importance in the investigation of fat preservation.

Peroxidase was found to accelerate and catalase to inhibit linoleic acid autoxidation.

Alkaloid distribution in the bark of some Peruvian cinchonas, W. H. HODGE (U. S. Dept. Agr., Forest Serv., Caribbean Forester, 7 (1946), No. 1, pp. 79-92; Span. trans., pp. 86-91; Fr. abs., pp. 91-92).—The analyses of selected bark samples of wild cinchona trees growing in Peru indicated that the alkaloid content varies appreciably in ascending from the base of a tree towards the top. In some types of cinchonas alkaloids were higher in quantity at the base of the trunk than in the upper parts of the tree, but in still other types of cinchonas the reverse condition existed with alkaloids lower in quantity at the base of the trunk than in the upper parts of the tree. Samples of wild trees taken for purposes of estimating commercial yields must include therefore bark from these two parts of the tree. A relationship also appeared to exist between the quantity of alkaloids present in a tree and the girth (or age) of the tree. Alkaloids either increased or decreased in quantity with increase in girth of the tree, and this increase or decrease depended upon the alkaloid and upon the type of cinchonal involved.

On the basis of the physiological evidence obtained, there appeared to be some question as to the correctness of the present taxonomic classification with the genus. This evidence is held to suggest that the bark collector's type morada is incorrectly included in the species *Cinchona pubescens*.

A product of oxidative metabolism of pyridoxine, 2-methyl-3-hydroxy-4-carboxy-5-hydroxy-methylpyridine (4-pyridoxic acid).—I, Isolation from urine, structure, and synthesis, J. W. HUFF and W. A. PERLZWEIG (Jour. Biol. Chem., 155 (1944), No. 1, pp. 345-355, illus. 3).—Detailed experiments are presented on the isolation, identification, and synthesis of the metabolite of pyridoxine, previously reported (E. S. R., 93, p. 370). The name 4-pyridoxic acid has been given to the fluorescent compound which appears in urine after the ingestion of pyridoxine. Based upon characteristic fluorescent curves of this metabolite and its lactone, a method was developed for the quantitative determination of either compound. The application of the method to the direct estimation of the lactone in urine is presented.

Production of tyrothricin in cultures of *Bacillus brevis*, J. C. LEWIS, K. P. DIMICK, and I. C. FEUSTEL. (U. S. D. A.). (Indus. and Engin. Chem., 37 (1945), No. 10, pp. 996-1004, illus. 8).—Yields of tyrothricin better than 2 gm. per liter of medium were obtained through the growth of *B. brevis* (B. G.) in shallow layers of medium. Maximum yields were found after 10 or 16 days of incubation at about 35° C. with the medium disposed in 11-mm. layers. Complex sources of nitrogen, including acid hydrolyzate of casein, corn-steep liquor, tryptic digest of soybean meal, and press juice concentrates from waste asparagus butts, proved most suitable; relatively simple substances, such as glutamic acid, asparagine, or

ammonium sulfate plus citric or malic acid, proved moderately effective in the presence of 0.2 percent of a specified proprietary bacterial nutrient. About 3 to 5 percent of a fermentable carbon compound, such as glucose, mannitol, or glycerol, was necessary for best yields. Fructose, sucrose, lactose, and maltose proved much less effective. Requirements for calcium, magnesium, and manganese were demonstrated. Unlike the other nitrogen sources mentioned, properly processed asparagus concentrates yielded nutritionally complete media without addition of sugar or inorganic elements.

A centrifuge tube agitator, R. F. REITEMEIER. (U. S. D. A.). (*Indus. and Engin. Chem., Analyt. Ed.*, 17 (1945), No. 4, p. 267, illus. 2).—The essential component of this device is the actuating mechanism of a manual valve grinder of a specified commercial make. The gears in the body of this tool are so designed that when the crank is turned in one direction the chuck moves $\frac{2}{3}$ revolution clockwise, then 1 revolution counterclockwise, and repeats this movement. Thus the motion of a centrifuge tube that rotates with the chuck somewhat resembles that of a tube rotated between the palms of the hands. When the crank is turned rapidly, the tube is agitated sufficiently to provide rapid mixing of the contents. A plastic holder for the centrifuge tube is described and is shown in a cross-section drawing. The agitator, arranged for motor operation and combined with a microburette titration assembly, is shown in a reproduction of a photograph. Constructional detail is given and dimensions fully specified.

An extractor for use with reduced pressure, W. F. BARTHEL. (U. S. D. A.). (*Indus. and Engin. Chem., Analyt. Ed.*, 17 (1945), No. 1, pp. 53–54, illus. 1).—Among the modifications described and figured are a glass extraction thimble with overflow tube, designed to keep the material being extracted covered continuously with fresh solvent, a long finger condenser with provision against vibration of its inner tube, and a side tube attached to the boiling flask to permit adding solvent and introducing a capillary leakage tube to induce smooth boiling. The finger condenser was substituted for the spiral or Allihn condensers of apparatus of the Soxhlet type because condensers of either of the last-named forms flooded when used under reduced pressure. The modified apparatus could be used at atmospheric as well as at reduced pressures.

Apparatus for measuring rate of gas penetration through food-packaging materials, F. R. SMITH and M. KLEIBER. (Univ. Calif.). (*Indus. and Engin. Chem., Analyt. Ed.*, 16 (1944), No. 9, pp. 586–587, illus. 1).—The authors describe an apparatus for measuring the rate of gas penetration through flexible materials. The apparatus was particularly suitable for determining the rate of oxygen penetration into pouches used for food packaging. The absolute accuracy of the measurements was determined mainly by the accuracy of gas analysis. The relative accuracy can be changed by varying the time of penetration and thus the difference between start and end concentration of oxygen in the gas inside the pouch.

Alternating current-operated thermionic titrimeter with adjustable range and sensitivity, E. M. BURAS, JR., and J. D. REID. (U. S. D. A.). (*Indus. and Engin. Chem., Analyt. Ed.*, 17 (1945), No. 2, pp. 120–125, illus. 4).—A stable, alternating current-operated, continuous reading, inexpensive vacuum tube voltmeter is described, the instrument having been designed to be simple in construction and operating. Its use as a titrimeter, a pH meter, and a direct current voltmeter is detailed. In the last-named application it served as a continuous reading potentiometer. It had a range of approximately 10 v. and a sensitivity of ± 0.0001 v. A calibration switch provided standard reference points for pH measurements. Independence of range and sensitivity controls made it versatile in electrochemical measurements with all the usual electrode systems, including the glass electrode.

Weighing funnels, M. S. SCHECHTER and H. L. HALLER. (U. S. D. A.). (*Indus. and Engin. Chem., Analyt. Ed.*, 16 (1944), No. 2, p. 133, illus. 1).—One of

these funnels has a body similar to that of a thistle tube, its stem being bent to form two return bends, the open end of the resulting S terminating a little below the level of the first turn. This funnel was suspended from the balance-pan hook by a fine wire at an angle such that a small liquid sample could be placed in the body of the funnel for weighing. By turning the funnel into a vertical position with the end of the stem hanging into the neck of the reaction flask, the sample could be washed into the flask, the solvent added from a washbottle siphoning intermittently in a manner which facilitated the transfer of samples of solids from the funnel into the flask.

The second funnel is of a pear shape, with a wide opening at its larger end, one side flattened to permit placing the funnel on the balance pan, and a short stem at the narrower end of the pear.

Mineral contamination resulting from grinding plant samples, S. L. HOOD, R. Q. PARKS, and C. HURWITZ. (U. S. D. A.). (*Indus. and Engin. Chem., Analyt. Ed.*, 16 (1944), No. 3, pp. 202-205, illus. 2).—Various grinding methods were compared to determine the number of elements added during grinding and their relative seriousness as contaminants in preparation of plant samples. This paper reports the effects of type of method, type of plant material, duration of grinding, and size of plant sample upon contamination.

Color of aqueous potassium dichromate solutions, R. E. KITSON and M. G. MELLON. (Purdue Univ.). (*Indus. and Engin. Chem., Analyt. Ed.*, 16 (1944), No. 1, pp. 42-44, illus. 3).—A spectrophotometric study of the color of aqueous potassium dichromate solutions included the effect of pH and of the concentration of acid, base, and dichromate. All these variables had an effect on the color of the solutions. Any recommendations of potassium dichromate solutions as permanent colorimetric standards should specify the exact nature of the solution.

Determination of water in dry food materials: Application of the Fischer volumetric method, C. M. JOHNSON. (U. S. D. A.). (*Indus. and Engin. Chem., Analyt. Ed.*, 17 (1945), No. 5, pp. 312-316, illus. 2).—With the Fischer volumetric method it was possible to determine the moisture content of starches, sugars, pectin, and spray-dried egg powder fairly rapidly and to get results that agreed with those obtained by the standard vacuum-oven technic. The apparent moisture contents of a number of dehydrated vegetables and fruit powders when determined by electrometric titration were generally slightly higher than those obtained by the vacuum-oven method.

In uncolored solutions, the end point of the Fischer titration could be detected fairly accurately by observing the appearance of the brown color of free iodine. In solutions containing colored substances or considerable quantities of spent reagent, the end point became exceedingly difficult to see, however. One of the most important adaptations of the Fischer method discussed in this paper consisted in the development of an electrometric detection of the end point. Interferences are discussed and are shown to be unlikely to introduce significant errors into the results of determinations of the moisture contents of foodstuffs.

Determination of moisture in naval stores products by the Karl Fischer method, V. E. GROTLISCH and H. N. BURSTEIN. (U. S. D. A.). (*Indus. and Engin. Chem., Analyt. Ed.*, 17 (1945), No. 6, pp. 382-383).—Although the moisture content in pine oils has been determined in a method of the Bidwell and Sterling type (E. S. R., 53, p. 805) with toluene as the solvent, the normal percentage of moisture in turpentine and other terpene solvents is too low to be determined in this way. The inapplicability of cloud-point moisture determinations is also shown. Separate Fischer titration procedures adapted for pine oils and for the terpene solvents, respectively, are detailed.

Microdetermination of nitrates by the Devarda method, R. KIESELBACH (*Indus. and Engin. Chem., Analyt. Ed.*, 16 (1944), No. 12, pp. 764-766, illus. 1).—It is shown that microquantities (0.05 milliequivalent) of nitrates can be determined with a precision and accuracy of 99.8 percent by reduction with Devarda's alloy, the ammonia liberated being absorbed in boric acid and titrated with 0.01 N hydrochloric acid to bromocresol green-methyl red end point. It is stated that by following the procedure given, a single determination could easily be made in 20 min. Nitrites and ammonia interfered, but interference of ammonia could be easily overcome. Special apparatus described was convenient, but not essential.

Catalytic activity of selenates in the Kjeldahl method for determination of nitrogen, R. S. DALRYMPLE and G. B. KING. (Wash. State Col.). (*Indus. and Engin. Chem., Analyt. Ed.*, 17 (1945), No. 6, pp. 403-404, illus. 1).—For a sample of pea meal, chosen as very difficult to decompose completely, digestion with metallic selenium as the catalyst required 6 hr. The use of copper selenate cut the digestion time to 2.5 hr., calcium selenate to 3 hr., and cadmium selenate to 3.5 hr. The nitrogen content determined by the Official (Kjeldahl-Gunning-Arnold) method was somewhat less than the maximum found when selenium or the selenates were used as the oxidation catalysts, but this method gave good agreement with the selenate methods in the analysis of some other samples. The nitrogen content determined with the aid of the selenates rose to a maximum and then fell off after more prolonged digestion, and so, because the optimum time of digestion would have determined for each type of protein sample and somewhat exactly adhered to, the authors do not consider the use of selenates to be practicable.

Factors affecting determination of potash in fertilizers, H. L. MITCHELL and O. W. FORD. (Ind. Expt. Sta.). (*Indus. and Engin. Chem., Analyt. Ed.*, 17 (1945), No. 2, pp. 115-116).—It was found that the presence of phosphates led to appreciably low results in the determination of potash by the official Lindo-Gladding method. Somewhat higher potash values were obtained when the phosphate was removed by precipitating with magnesium chloride. When freshly prepared sodium hydroxide solutions were used, the potassium chloroplatinate was contaminated with little or no water-insoluble residue. However, upon standing for some time, sufficient sodium silicate was produced by action of the alkali on the glass container to cause the formation of considerable residue.

Photometric determination of phosphorus in limestone, J. A. BRABSON, J. H. KARCHMER, and M. S. KATZ (*Indus. and Engin. Chem., Analyt. Ed.*, 16 (1944), No. 9, pp. 553-554, illus. 1).—The authors describe a photometric method for the determination of phosphorus in limestone when present in amounts ranging from 0.002 to 0.4 percent P_2O_5 . The sample is ignited to destroy organic matter, which is removed by dehydration with perchloric acid, and phosphorus is determined in the filtrate by the phosphovanadomolybdate method. When applied to National Bureau of Standards samples of argillaceous limestone 1 and 1-a, containing 0.18 and 0.14 percent P_2O_5 , respectively, results within 0.01 percent of the Bureau of Standards values were found. The effect of interfering elements and the use of a filter photometer are discussed.

Determination of cobalt in biological materials with nitrosocresol, G. H. ELLIS and J. F. THOMPSON. (U. S. D. A.). (*Indus. and Engin. Chem., Analyt. Ed.*, 17 (1945), No. 4, pp. 254-257, illus. 1).—A quantitative colorimetric procedure for the determination of from 0.02 to 25 μ g. of cobalt in plant or animal tissues is described. The method depends on the formation of the colored complex of cobalt with *o*-nitrosocresol, which is extracted from the aqueous phase by ligroin and measured in a photoelectric colorimeter fitted with absorption cells 10 cm. in depth, requiring a volume of 1.8 cc.

It was found that in most plant and animal tissues the cobalt concentrations are so small in proportion to those of iron that the use of a citrate buffer was not sufficient to prevent iron interference in the cobalt determination. The iron could, however, be separated completely from the cobalt by extraction with suitable solutions either of dithizone or of sodium diethyldithiocarbamate, the first-named of these reagents being the more generally applicable. The compound referred to as nitrosocresol or as *o*-nitrosocresol was 3-hydroxy-4-nitrosotoluene, and was prepared as a solution of its copper salt by treating a solution of *m*-cresol and cupric chloride with hydroxylamine and adding 30 percent hydrogen peroxide. In a refrigerator, this stock solution was stable for months. For the cobalt determination, a solution of the less stable sodium salt of the nitroso compound was prepared from the stock copper-salt solution.

Ashing procedures for the determination of copper in plant material, L. F. BAILEY and J. S. MCHARGUE. (Ky. Expt. Sta.). (*Plant Physiol.*, 20 (1945), No. 1, pp. 79-85).—Porcelain and silica dishes used for ashing tomato and alfalfa plant materials altered the copper content of these materials. Platinum crucibles interfered in the determination of copper with sodium diethyldithiocarbamate. Wet ashing appeared to be much more reliable when copper was to be determined. Results from three wet ashing procedures were in good agreement.

Colorimetric determination of iron with disodium-1,2-dihydroxybenzene-3,5-disulfonate, J. H. YOE and A. L. JONES (*Indus. and Engin. Chem., Analyt. Ed.*, 16 (1944), No. 2, pp. 111-115, illus. 3).—The catechol derivative named was found to constitute a sensitive, stable, and widely applicable reagent for the colorimetric determination of ferric iron. The nature of the reaction and chemical behavior of the ferric complex was studied both visually and spectrophotometrically. The reagent could be used in either acid or alkaline medium. In alkaline solution (pH 9 to 10), it was sensitive to 1 part of iron in 200,000,000 parts of solution when observations were made in Nessler cylinders (50-cc., tall-form). In acid solution (pH 3.5 to 4.5), the sensitivity was 1 part in 30,000,000. The colored complexes (red in alkaline medium, blue in acid) obeyed Beer's law over the useful range of iron concentration. A variety of materials was analyzed with a high degree of accuracy. The number of interfering ions was found small. Analyses could be carried out in the presence of fluorides, phosphates, tartrates, citrates, oxalates, etc. Procedures for the use of the reagent are given.

Determination of small amounts of molybdenum in plants and soils, M. L. NICHOLS and L. H. ROGERS. (Cornell Univ.). (*Indus. and Engin. Chem., Analyt. Ed.*, 16 (1944), No. 2, pp. 137-140, illus. 2).—Spectrographic, colorimetric, and polarographic procedures for the determination of small quantities of molybdenum in plants and soils were studied. It is concluded that, for the ordinary laboratory, the colorimetric procedure is superior if reasonable amounts of sample (1 gm. or more of soils, 10 gm. or more of air-dried plant material) are available. However, if only small quantities of sample are available (100 mg. of soil, 1 gm. of air-dried plant material), the spectrographic procedure is recommended. The polarographic procedure was found to have no particular advantages over the other two.

A modification of the ethanolamine hydrolysis method for determination of methyl bromide, R. D. CHISHOLM and L. KOBLITSKY. (U. S. D. A.). (*Indus. and Engin. Chem., Analyt. Ed.*, 16 (1944), No. 8, p. 538).—The modified method here described was designed for the sampling of the atmosphere of fumigation chambers during experiments on the behavior of methyl bromide as an insecticidal fumigant. It involved withdrawal by aspiration of a portion of the atmosphere of the chamber, passing it through a series of absorption tubes packed with sand wet with ethanolamine, and subsequent determination of the bromide ion by the Volhard method. In this way gas losses during sampling were avoided. In a

chamber exposed to the effect of wind, recovery of methyl bromide from a volume of 1,000 cu. ft. ranged from the equivalent of 96 to 100 percent of a 1-lb. charge (mean recovery 97 percent), 95 to 100 percent of a 2-lb. charge (mean recovery 97 percent), and 91 to 98 percent of a 4-lb. charge (mean recovery 95 percent). The samples were taken 15 min. after introduction of the fumigant. Making a calculated correction for normal rate of leakage and increased rate due to wind, the authors found the actual recoveries to be from 1 to 2 percent greater than those above indicated.

Determination of starch in sweet potato products and other plant materials, E. T. STEINER and J. D. GUTHRIE. (U. S. D. A.). (*Indus. and Engin. Chem., Analyt. Ed.*, 16 (1944), No. 12, pp. 736-739).—A polarimetric method was adapted for the determination of starch in sweetpotato products and other plant materials. By use of the specific and quantitative precipitation of starch as starch iodide and by the further use of developed uranyl acetate as a protein precipitant, the effect of substances which interfere with most methods for the determination of starch was largely eliminated. When the method was tested on samples containing large amounts of protein, pectin, inulin, and other interfering substances, the starch values obtained were closer to the true starch content than were those found by either the malt-diastase or Hopkins method. The addition of a number of different substances commonly found in biological materials did not significantly alter the starch values obtained with the proposed method. The procedure described appeared to be applicable to materials containing 10 percent or more starch on the moisture-free basis. The specific rotation for the conversion of polarimetric readings to starch was found to be 200.9 for the proposed method.

Analysis of wood sugars, J. F. SAEMAN, F. F. HARRIS, and A. A. KLINE. (U. S. D. A. et al.). (*Indus. and Engin. Chem., Analyt. Ed.*, 17 (1945), No. 2, pp. 95-99, illus. 6).—It is noted that experimental work on wood saccharification requires determinations of reducing and fermentable sugars and of alcohol which will be dependable, simple, rapid, and capable of being carried out in large numbers. Two copper-reduction methods were used for the determination of reducing sugars—one an electrometric titration method and the other a micromethod. The electrometric titration method was used when it was desirable to have a sugar analysis in as short a time as possible, the micromethod when large numbers of determinations were made or when concentrations and quantities available were too low for the macro-methods. Fermentable sugars were estimated by determining the amount of sugar sorbed from a 1.5 mg. per cubic centimeter solution by a 5.0 percent yeast suspension. Alcohol was determined by the specific gravity method, using a Westphal balance with a thermostated container for the beer distillate. It was found that the error due to the effect of surface tension on the wire supporting the bob could be eliminated by the addition of a very small quantity of a wetting agent.

Microdetermination of hydroxyl content of sugars and glycosides, B. E. CHRISTENSEN and R. A. CLARKE. (Oreg. State Col.). (*Indus. and Engin. Chem., Analyt. Ed.*, 17 (1945), No. 4, p. 265).—A method which had been found successful for numerous alcohols, phenols, and polyhydroxy compounds, and consisted essentially in esterifying with acetic anhydride in pyridine solution in a sealed tube and titrating the acid liberated on contact of the reaction mixture with water, was adapted for use with sugars and glycosides by the use of a larger volume of pyridine to bring the sugars into solution and by increasing the time allowed for the esterification.

Microdetermination of acetyl groups in acetates of sugars and glycosides, R. CLARKE and B. E. CHRISTENSEN. (Oreg. State Col.). (*Indus. and Engin. Chem., Analyt. Ed.*, 17 (1945), No. 5, pp. 331-335, illus. 1).—A 5- to 10-mg. sample of the acetate was weighed out in a small glass boat and placed in a 25-cc. Erlen-

meyer flask. The sample was then dissolved in 95 percent ethanol, 2 to 5 cc., depending upon the solubility of the acetate, and warmed if necessary to obtain solution. Four cc. of 0.045 N sodium hydroxide (carbonate-free) were added from a microburet. The flasks were stoppered and shaken mechanically or intermittently by hand for 4 to 24 hr. at 20° C. The excess alkali was neutralized with dilute sulfuric acid (0.05 N) using phenolphthalein indicator. These conditions appeared satisfactory in all tests except those applied to the reducing monosaccharides. The deacetylation of glucose penta-acetate at 20° gave high results even when 0.015 N sodium hydroxide was used, an observation taken to indicate that oxidation accompanied the hydrolysis. The slower hydrolysis occurring at 0° gave more nearly normal results.

Determining chlorophyll, carotene, and xanthophyll in plants, R. B. GRIFFITH and R. N. JEFFREY. (Ky. Expt. Sta.). (*Indus. and Engin. Chem., Analyt. Ed.*, 16 (1944), No. 7, pp. 438-440).—A method for the determination of chlorophylls a and b, carotene, and total xanthophyll from a single ether solution is described. This method is considered to be adaptable to any spectrophotometer of good resolving power provided preparations are available for determination of absorption constants for the instrument to be used. The pigments were extracted from the plant material with acetone and transferred to ether, and chlorophyll was determined from the light absorption at the wave lengths of the chlorophyll a and b maxima in the red end of the spectrum. Carotene and xanthophyll were separated in the unsaponified ether solution by means of the flowing chromatographic technic and then determined spectrophotometrically. Evidence of the reproducibility of results which may be expected from this method is presented. The results of single determinations were found to seldom vary more, with respect to each pigment determined, than 5 percent from the average of those given by four similar samples.

Determining the hydroxyl content of certain organic compounds: Macro- and semimicromethods, C. L. OGG, W. L. PORTER and C. O. WILLITS. (U. S. D. A.). (*Indus. and Engin. Chem., Analyt. Ed.*, 17 (1945), No. 6, pp. 394-397, illus. 3).—A modification of macroprocedures for determining the hydroxyl content of hydroxylated fatty acids and alcohols is described, an internal indicator having been used. For colored solutions a potentiometric method was developed. A semimicro-procedure using an internal indicator is also presented. An acetylating solution of 1 volume of acetic anhydride in 3 volumes of pyridine and a hot-water hydrolysis were used.

Errors in the Zeisel methoxyl values for pectin due to retained alcohol, E. F. JANSEN, S. W. WAISBROT, and E. RIETZ. (U. S. D. A.). (*Indus. and Engin. Chem., Analyt. Ed.*, 16 (1944), No. 8, pp. 523-524).—Retained ethanol caused the methoxyl content of pectins, as measured by the Zeisel method, to be as much as 20 percent higher than saponification values. This ethanol cannot be removed by the usual drying technics, even the Abderhalden drier procedure reducing the apparent Zeisel methoxyl content only slightly, but can be removed by humidification followed by drying. Acetone rather than ethanol precipitation results in good agreement between the two methods of analysis. Retained isopropyl alcohol can be removed by drying at 100° C. The humidification, above mentioned, was accomplished by placing the pectin samples in a desiccator containing water instead of a drying agent, toluene being placed on the water surface to prevent mold growth. The required humidification was attained either with or without a slow stream of air bubbled through the water.

Analysis of the organic acids of orange juice, W. B. SINCLAIR, E. T. BARTHOLOMEW, and R. C. RAMSEY. (Calif. Citrus Expt. Sta.). (*Plant Physiol.*, 20 (1945), No. 1, pp. 3-18, illus. 4).—The acid constituents of orange juice, as determined by titrating the juice directly with standard NaOH to a phenolphthalein end point, were

equivalent to the percentages determined by the lead acetate method. The total free acids determined from the points of inflection on the titration curves were significantly lower than those reported both for the phenolphthalein titration and for the lead acetate method. When juice samples were titrated, with phenolphthalein as indicator, the end points ranged from pH 8.25 to 8.45. The potentiometric values were taken to represent more accurately the total acidity. The concentration of malic acid in various juice samples differed only slightly as compared with the changes in the citric acid content. With one exception, the samples studied had a malic acid content of from 1.40 to 1.77 mg. per milliliter.

"Apparently, there is a definite relation between the free acid-combined acid balance and the pH of the juice. The amount of combined acids in the juice is remarkably uniform; this indicates that the free-acid concentration is the chief variable. With a decrease in the value of

total free acid

total free and combined acids

a corresponding rise in pH occurs."

Determination of sesamin. M. JACOBSON, F. ACREE, JR., and H. L. HALLER. (U. S. D. A.). (*Indus. and Engin. Chem., Analyt. Ed.*, 16 (1944), No. 3, pp. 166-167, *illus.* 1).—A method for the quantitative determination of sesamin in sesame oil is based upon measurement of the greenish-yellow color produced by sesamin when it is allowed to react with a mixture of perchloric acid and hydrogen peroxide. The standard error of the final result was found to be practically constant, amounting to about ± 0.05 percent of sesamin when the result of a single determination on an unknown is read from a curve established from 10 replicates.

Determination of wax in cotton fiber: A new alcohol extraction method. C. M. CONRAD. (U. S. D. A.). (*Indus. and Engin. Chem., Analyt. Ed.*, 16 (1944), No. 12, pp. 745-748, *illus.* 1).—A new technic for the determination of the wax of cotton fiber consists of a two-step process in which the wax is first extracted with hot 95 percent ethyl alcohol and then transferred to chloroform through a phase-separation process, in order to eliminate sugars, mineral constituents, and other nonwaxy constituents removed at the same time by the alcohol. The wax is extracted from cotton fiber more rapidly by hot alcohol than by chloroform, the most rapid and adequate of a considerable number of common wax solvents previously studied. The wax thus determined contains a negligible amount of mineral impurities and is less contaminated with sugars than that determined in the usual Soxhlet extraction.

Adsorption analysis of colorless compounds: Method and application to the resolution of stearic and oleic acids. H. J. DUTTON. (U. S. D. A.). (*Jour. Phys. Chem.*, 48 (1944), No. 4, pp. 179-186, *illus.* 4).—The authors describe an adsorption analysis and separation technic made applicable to colorless compounds by the use of a highly sensitive differential refractometer modified for measurement of changes in the refractive index of percolates from adsorption columns during continuous flow. The resolution of stearic and oleic acids was studied as an example of the application of this general method. Advantages and limitations of the method are discussed. As development of the column is provided for in the modified method, and the size of the adsorption column is not restricted, the new technic is applicable to large-scale preparative as well as qualitative and quantitative analytical procedures. Furthermore, the observed readings from this system are directly proportional to the difference between the refractive indices of the solution and the solvent (Δn), and hence are proportional to the concentration where a single solute is involved.

Determination of sulfur dioxide in dehydrated foods. A. N. PRATER, C. M. JOHNSON, M. F. POOL, and G. MACKINNEY. (U. S. D. A. coop. Univ. Calif.). (*Indus. and Engin. Chem., Analyt. Ed.*, 16 (1944), No. 3, pp. 153-157, *illus.* 2).—In principle, the method described consists in extracting the sulfur dioxide from the

finely ground sample with a weak aqueous sodium hydroxide solution, titrating for total reducing substances with iodine, treating a second aliquot with acetone after adjustment of the pH value from 2 to 3, and then determining the reducing power for the iodine solution used of the reducing substances other than sulfur dioxide by a second iodine titration. The reliability of the method was established by recovery of added sulfur dioxide and by comparison with distillation and polarographic methods.

Determination of total sulfur in feeds: Modified nitric and perchloric acid digestion procedure, R. J. EVANS and J. L. ST. JOHN. (Wash. Expt. Sta.). (*Indus. and Engin. Chem., Analyt. Ed.*, 16 (1944), No. 10, pp. 630-631).—A method of determining the total sulfur content of feeds and similar substances by destroying the organic matter and oxidizing the sulfur compounds to sulfates by digestion with nitric and perchloric acids is described. The sample is dissolved and partially oxidized by heating with concentrated nitric acid on a steam bath for 24 hr. The most important modification is the more complete oxidation of the sulfur compounds to sulfates, which is accomplished by gentle boiling with perchloric acid for about 15 hr. The results obtained agree with those by the Parr bomb method.

Separation of cholesterol from degreas, L. YODER, O. R. SWEENEY, and L. K. ARNOLD. (Iowa Expt. Sta.). (*Indus. and Engin. Chem.*, 37 (1945), No. 4, pp. 374-377, illus. 4).—Wool fat (degreas) was saponified in 52.5-lb. batches by sodium hydroxide, and the unsaponifiable material was extracted from the wet soaps by gravity separation with ethylene dichloride. Cholesterol of 97 percent digitonin precipitability was prepared from the unsaponifiable extract in 4-lb. yields per batch by a pilot process based on the formation of the oxalic acid addition product insoluble in ethylene dichloride solutions. Byproducts obtained per batch were 37 lb. of fatty acids, 14 lb. of oily unsaponifiable material, and 9 lb. of ischolesterol wax.

Some color tests for rotenone not specific, H. L. HALLER. (U. S. D. A.). (*Indus. and Engin. Chem., Analyt. Ed.*, 16 (1944), No. 4, p. 277).—The author reports experiments indicating that neither the evanescent blue color produced by treating rotenone with nitric acid and then with ammonia, nor the red color formed when the compound is treated with alcoholic potassium hydroxide containing sodium nitrite and then acidified with sulfuric acid can be regarded as entirely specific for rotenone or rotenoid compounds. From the results reported, it is concluded that "considerable caution should be taken in interpreting the color obtained in both these tests when they are applied to plant material other than *Derris*, *Lonchocarpus*, and *Tephrosia*. Rotenone should be reported as present in plants only when it has been definitely isolated and characterized."

Colorimetric analysis of xanthone spray residues, C. C. CASSIL and J. W. HANSEN. (U. S. D. A.). (*Indus. and Engin. Chem., Analyt. Ed.*, 16 (1944), No. 1, pp. 35-37, illus. 2).—A colorimetric method for the determination of xanthone spray residues consists in adding a measured quantity of toluene to a sample of apples or apple plugs in a glass jar and shaking for 5 min. The resulting solution of xanthone and apple waxes is filtered and an aliquot of the filtrate taken for analysis. The xanthone is reduced to xanthidrol by refluxing with sodium amalgam in toluene and methanol. After removal of the methanol by a water extraction, an aliquot of the supernatant toluene solution is swirled in concentrated hydrochloric acid, effecting an equilibrium transfer of the xanthidrol to the acid layer to give a yellow color, which is measured photometrically.

The effect of light on the stability of the Carr-Price color in the determination of vitamin A, M. J. CALDWELL and D. B. PARRISH. (Kans. Expt. Sta.). (*Jour. Biol. Chem.*, 158 (1945), No. 1, pp. 181-186, illus. 1).—Standard solutions of vitamin A were studied under carefully controlled conditions in various photometers where the intensities of the light illumination were determined or regulated. Graphic repre-

sentations of the results illustrate the marked influence of the light intensity upon the rate of fading of the characteristic blue color of the reaction. Loss of color ranged from 7.8 percent in the Evelyn photometer to as high as 89.4 percent when a 200-watt bulb was used. In the Coleman photometer, reduction of the incident light from 100 to 13 decreased the fading from 39 to 18.2 percent for a 60-sec. reading interval.

Exposure of the vitamin A solution to strong light (for 2 min.) prior to the addition of the antimony trichloride (which causes formation of the blue color) did not affect the subsequent color production.

The influence of illumination on the accuracy of the determination and its effect on the kinetics of the Carr-Price reaction is discussed.

Determination of vitamin A in dehydrated eggs, W. G. SCHRENK, D. S. CHAPIN, and R. M. CONRAD. (Kans. Expt. Sta.). (*Indus. and Engin. Chem., Analyt. Ed.*, 16 (1944), No. 10, pp. 632-634, illus. 1).—A spectro-chemical method for the determination of vitamin A in dehydrated eggs is described. The procedure involves careful control of analytical conditions, followed by the use of a correction factor required because of the absorption of ultraviolet radiation by the carotenoid pigments present. The correction had to be so defined as to include the effects of isomerization of the pigments caused by the analytical process, and was determined on the basis of the two principal pigments present, luteol and zeaxanthol. The absorption spectra of these two pigments, in absolute ether, and the specific absorption coefficients at their wave lengths of maximum and minimum absorption are presented.

Chromatographic determination of carotene in alfalfa, L. W. CHARKEY and H. S. WILGUS, JR. (Colo. Expt. Sta.). (*Indus. and Engin. Chem., Analyt. Ed.*, 16 (1944), No. 3, pp. 184-187, illus. 3).—The author reports, with experimental results indicating its accuracy, an adsorption-column method which avoids the oxidative losses of carotene generally encountered in freshly harvested plant tissues, as well as errors due to incomplete extraction and incomplete separation of carotenes from other pigments present. The method includes an enzyme inactivation and sample storage procedure, making possible the collection and preparation of large numbers of samples on fixed dates. The chromatographic technic was modified for the purpose at hand by converting the adsorption column to an adsorption filter which avoids losses of adsorbed carotene.

Effects of beta-carotene isomerization on its absorption at 326 millimicrons, W. G. SCHRENK, R. E. SILKER, and H. H. KING. (Kans. Expt. Sta.). (*Indus. and Engin. Chem., Analyt. Ed.*, 16 (1944), No. 5, pp. 328-329, illus. 1).—The authors report observations indicating a straight-line relationship between the extent of the isomerization of β -carotene and its calculated optical density ratios. They hold that the isomerization of β -carotene, due in part to heating of the material under examination, is at least partly responsible for the wide range of correction values in use in the determination of vitamin A from its ultraviolet absorption. The correction required at 326 m μ for β -carotene in a specified commercial light-petroleum solvent was calculated on the basis of spectrophotometer data and shown to be a linear function of the percentage isomerization.

The vitamin B₆ group, III-IV, VI-VII (*Jour. Biol. Chem.*, 157 (1945), No. 2, pp. 475-505; 158 (1945), No. 2, pp. 491-503).

III. *The vitamin activity of pyridoxal and pyridoxamine for various organisms*, E. E. Snell and A. N. Rannefeld (pp. 475-489).—Preliminary studies by Snell (E. S. R., 93, p. 660) on the activities of pyridoxal (I) and pyridoxamine (II) as growth factors for micro-organisms have been extended.

Pyridoxine, as well as (I), (II), and several related derivatives including the isomeric amine and aldehyde, the 5-formyl derivative, and 4-pyridoxic acid and its

lactone, were tested with the following organisms: *Streptococcus faecalis* R, *Lactobacillus casei*, and *Saccharomyces carlsbergensis*. Rats, yeasts, molds, and bacteria served to test the relative activities of (I), (II), and pyridoxine. Results showed that these three compounds had approximately equal activity on a molecular basis for rats, *S. carlsbergensis*, and *Neurospora sitophila*. It was observed that for a large group of lactic acid bacteria, the activities of (I) and (II) varied from a few fold to several thousand fold that of pyridoxine. Autoclaving the medium containing (I) and (II) produced changes which could be detected by the use of different test organisms. Pyridoxal and pyridoxamine were destroyed by light, and were found to be labile when heated in a dilute water solution containing dissolved air.

The implications of some of the results are discussed.

IV. *Evidence for the occurrence of pyridoxamine and pyridoxal in natural products*, E. E. Snell (pp. 491-505).—Based upon the findings that pyridoxal (I), pyridoxamine (II), and pyridoxine (III) have equal growth activities for yeast (see above), a differential test has been devised. *L. casei* was used for the pyridoxal standard, *Streptococcus faecalis* for (II), and *Saccharomyces carlsbergensis* for (III). Natural compounds, yeast extract, liver extract, rice bran concentrate, and powdered dehydrated grass juice were tested for their content of these three derivatives by subjecting them to various chemical treatments.

Results showed that pyridoxal and the pyridoxal fraction of natural materials are inactivated in a comparable fashion by incubation with acetone in alkali, incubation with sodium cyanide and ammonium chloride, or autoclaving with hydrolyzed casein. They remain undamaged by treatment with nitrous acid.

Pyridoxamine and the pyridoxamine fraction of the products tested are completely inactivated by nitrous acid. Autoclaving with α -ketoglutaric acid decreases the activity of (II) and increases the activity of (I). This is interpreted by the author as a conversion of (II) to (I).

"It is concluded that pyridoxal and pyridoxamine occur naturally, that they constitute a considerable portion of the total vitamin B₆ present in many natural materials, and that the proportions in which the three compounds occur differ markedly with different materials. The presence of these compounds satisfactorily explains 'pseudopyridoxine' activity."

VI. *The comparative stability of pyridoxine, pyridoxamine, and pyridoxal*, E. Cunningham and E. E. Snell (pp. 491-495).—Experiments were made on the effect of light, acids, alkali, and oxidizing agents on pyridoxine, pyridoxamine, and pyridoxal.

Results showed that upon exposure to direct sunlight, diffused daylight, or artificial light all three compounds were rapidly inactivated. Greatest loss of activity occurred with exposure to direct sunlight and in neutral or alkali solutions. Pyridoxamine showed the greatest sensitivity, being unstable in direct sunlight in 0.1 N acid solution while pyridoxine and pyridoxal were comparatively stable in acid solution. Oxidizing agents (manganese dioxide (in acid) and potassium permanganate) rapidly destroyed all three compounds. Heating at 100° C. with 5 N H₂SO₄ or HCl did not alter the activity of pyridoxine, pyridoxal, or pyridoxamine, while HNO₃ caused rapid destruction under similar conditions. Pyridoxal alone was slightly inactivated when heated 1 hr. with 5 N NaOH.

VII. *Replacement of vitamin B₆ for some microorganisms by d(—)-alanine and an unidentified factor from casein*, E. E. Snell (pp. 497-503).—An enzymatic digest of vitamin-free casein was found to contain a substance which, together with dl-alanine, permitted growth of *L. casei* in the absence of vitamin B₆. This substance differs from B₆ as it is destroyed by acid or alkaline hydrolysis, is not destroyed by light, and is not readily adsorbed from aqueous solutions by charcoal.

When optimal levels of this substance were added to the vitamin B₆-free medium, the growth response of *L. casei* to alanine could be calculated. It was noted that

under these circumstances *d*(—)-alanine promoted growth, while *l*(+)-alanine was almost inactive showing less than 1 percent of the activity of the *d*-form.

Alanine alone could replace vitamin B₆ for *Streptococcus faecalis* R. In this respect *l*(+)-alanine was less than one-sixth as active as *d*(—)-alanine. When the growth response of the same organism to the optical antipodes of alanine was determined in an alanine-free medium which contained vitamin B₆, it is found that *l*(+)-alanine was most active, while *d*(—)-alanine showed considerably less activity. The author suggests that both optical forms of alanine are required for growth of these organisms in the absence of vitamin B₆, each serving different functions within the organism.

A short discussion of these results is included.

The response of *Lactobacillus casei* and *Streptococcus faecalis* to vitamin B₆ and thymine, K. KRUEGER and W. H. PETERSON. (Wis. Expt. Sta.). (*Jour. Biol. Chem.*, 158 (1945), No. 1, pp. 145-156, illus. 3).—*L. casei* 7409 and *S. faecalis* 8043 (*S. lactis* R.) were used to test the vitamin B₆ (norit eluate factor) potency of various preparations.

Material isolated from yeast or liver showed the same B₆ potency for both organisms. It was found that thymine could replace B₆ completely in the nutrition of *L. casei* and to a lesser extent with *S. faecalis*. As little as 1 µg. of free thymine in a test sample could erroneously influence the growth response to a marked degree.

Both hydrolyzed casein and synthetic amino acid media were used for the *L. casei* assays. At the 0.5 percent level, the hydrolyzed casein medium did not give optimum response to vitamin B₆, as supplementation with alanine or leucine, isoleucine, and threonine resulted in an approximately 10 percent increase in titer with the various levels of B₆ used, while leaving the blank unaffected.

The effect of these variables upon the accuracy of the assay with either organism is discussed. Twenty-five references are included.

Growth stimulants for microbiological biotin assay, V. R. WILLIAMS and E. A. FIEGER. (Ia. Expt. Sta.). (*Indus. and Engin. Chem., Analyt. Ed.*, 17 (1945), No. 2, pp. 127-130, illus. 3).—The microbiological determination of biotin (using *Lactobacillus casei*) was investigated from the standpoint of growth stimulants. The lipid nature of such interfering factors in rice polish was established by comparing extracts that had been treated by filtration, ether-extraction, enzyme digestion, etc. Methods for obviating the stimulating effect were devised. Various supplements to the basal medium were tested, but none was found successful enough to justify recommendation. Lecithin, mineral oil, oleic acid, whole rice oil, and the unsaponifiable fraction of rice oil were compared as to extent of stimulation produced. In tubes showing high acid and cell production in the presence of basal medium and rice oil without added pure biotin, no evidence of biotin synthesis could be demonstrated.

Chemical determination and urinary excretion of the metabolite N¹-methylnicotinamide, M. HOCHBERG, D. MELNICK, and B. L. OSER (*Jour. Biol. Chem.*, 158 (1945), No. 1, pp. 265-278, illus. 3).—A method is described in detail for the chemical determination of N¹-methylnicotinamide in urine. The steps involved include direct adsorption of the metabolite on an activated zeolite column, elution with potassium chloride, treatment of the eluate with alkali, development of the fluorescence to maximal intensity in butanol, and comparison of the butanol solution in a fluorometer with a standard similarly treated. Correction for the blank fluorescence is made prior to alkalization. Quantitative recovery of the added N¹-methylnicotinamide chloride is routinely obtained only when the urine aliquot used is a 6 min. sample or less. The simplified procedure is such that only 1 zeolite column is necessary and 15 urine samples may be tested in 1 day.

Eight normal subjects, subsisting on an adequate diet containing 23 mg. of nicotinic acid (or amide) per day, excreted in 24 hr. from 3.1 to 8.0 mg. of N¹-methylnicotina-

mide, calculated as nicotinamide. Their average basal excretion value amounted to 24 percent of the dietary intake. Extra excretion of the metabolite following oral postprandial dosage with 50 to 200 mg. of nicotinamide occurred and was approximately 20 percent. An appreciable variation in the values obtained at a given dose level was observed, but the responses of each subject were fairly consistent at different levels of intake. The advantages of the present method are discussed.

Determination of riboflavin in low-potency foods and feeds, S. H. RUBIN, E. DE RITTER, R. L. SCHUMAN, and J. C. BAVERNFEIND (*Indus. and Engin. Chem., Analyt. Ed.*, 17 (1945), No. 3, pp. 136-140, illus. 1).—A modification of the fluorometric method of Hodson and Norris (*E. S. R.*, 83, p. 151) is described in detail. The principal changes are: (1) "Extraction in a more dilute acid solution with the aid of a blender; (2) optional use of clarase digestion at pH 4.5; (3) optional use of permanganate treatment at pH 4.5; (4) a riboflavin recovery step when permanganate is used; (5) double reduction of the riboflavin at pH 4.5 instead of 7 to 7.5; and (6) use of the minimum quantity of sodium hydrosulfite during the second reduction of the riboflavin. Two steps require careful adjustment—the back-titration with dilute hydrogen peroxide after permanganate oxidation, and the second reduction of riboflavin by dilute sodium hydrosulfite."

A number of foods including rice, poultry mash, meat, breakfast foods, and a variety of flour or bread products have been assayed. Comparisons are made with other chemical methods and a microbiological method. The authors report that "results by this method showed better agreement with the microbiological assay than did results by fluorometric procedures employing Florisil adsorption."

Fluorometric determination of riboflavin in eggs, W. J. PETERSON, R. S. DEARSTYNE, R. E. COMSTOCK, and V. WELDON. (N. C. Expt. Sta.). (*Indus. and Engin. Chem., Analyt. Ed.*, 17 (1945), No. 6, pp. 370-371).—Stable emulsions which interfered in the fluorometric determination of riboflavin in egg yolks can be clarified by mixing the extract in a Waring blender with a small amount of chloroform. Average riboflavin values for all eggs studied were (micrograms per gram): Yolk, 4.1; white, 2.7; entire egg, 3.2. Variations from day to day in the riboflavin content of eggs from the same bird were extremely small. The difference in the riboflavin content of eggs from different birds on the same ration was large and highly significant. The average ratio of riboflavin in yolks to riboflavin in whites was 1.53. The standard deviation of the ratio was 0.48.

Use of *Lactobacillus arabinosus* 17-5 for microassay of pantothenic acid, E. H. HOAG, H. P. SARETT, and V. H. CHELDELIN. (Oreg. State Col.). (*Indus. and Engin. Chem., Analyt. Ed.*, 17 (1945), No. 1, pp. 60-62, illus. 2).—A rapid microbiological assay method for pantothenic acid used *L. arabinosus* as the test organism. With the growth medium used, assay values with good recoveries of added pantothenic acid could be obtained turbidimetrically after 14 hours' growth, or titrimetrically after 24 to 30 hr. The response to pantothenic acid in the effective assay range (0.01 to 0.08 μ g. of pantothenic acid) is greater and more rapid for this organism than for *L. casei*.

Good agreement between pantothenic acid values of foodstuffs as determined by the two organisms was obtained. Assay values of yeast concentrates by the chick method are higher than those obtained microbiologically, however.

Determination of gamma-tocopherol in vegetable oils, G. S. FISHER. (U. S. D. A.). (*Indus. and Engin. Chem., Analyt. Ed.*, 17 (1945), No. 4, pp. 224-227, illus. 2).—The assumption that the use of an alcohol as solvent is necessary to the production of a red color in the oxidation of the tocopherols by nitric acid was found to hold only for α -tocopherol. Red solutions were formed when either β - or γ -tocopherol was oxidized by nitric acid in solution in acetic acid. The α -tocopherol gave only a slightly yellow solution when treated in this way. The intensity

both of the red color obtained by the oxidation of γ -tocophorol and of the yellow color produced by like treatment of α -tocophorol was proportional to the concentration of the respective tocophorol. It was, therefore, possible to determine γ -tocophorol in the presence of α -tocophorol by use of a photoelectric colorimeter and the principle of differential spectral separation. The details of a method of determining γ -tocophorol by oxidation with nitric acid in the presence of acetic acid, followed by photometric estimation of the red color produced, are presented, together with the results of its application to several vegetable oils.

Purification of solvents for absorption spectroscopy: An adsorption method, M. M. GRAFF, R. T. O'CONNOR, and E. L. SKAU. (U. S. D. A.). (*Indus. and Engin. Chem., Analyt. Ed.*, 16 (1944), No. 9, pp. 556-557, illus. 1).—A simple, rapid method for removing ultraviolet-absorbing impurities from hydrocarbon solvents by selective adsorption on silica gel columns is described. Solvents suitable for use in absorption spectrum measurements were prepared by this method from commercial samples of cyclohexane, *n*-heptane, iso-octane, and two specified commercial light-petroleum solvents. In general, hydrocarbon solvents, both synthetic and commercial, which were subjected to exhaustive chemical and physical purification were noticeably improved by this adsorptive treatment. The advantages of the adsorption method over the usual methods were speed, simplicity of technic, and high yield of purified solvent.

Apple sirup by ion exchange process, R. E. BUCK and H. H. MOTTERN. (U. S. D. A.). (*Indus. and Engin. Chem.*, 37 (1945), No. 7, pp. 635-639, illus. 6).—The removal of most of the malic acid from apple juice by anion adsorption avoided the bitter aftertaste of calcium malate formed by liming the original juice in the preparation of apple sirup. Anion adsorption also removed arsenic from spray residue. Lead was almost completely removed in the final step of liming and was not a serious problem. Three methods of treatment were tested. From the standpoint of flavor the simplest treatment with a single anion exchanger was the most practical. It removed about 80 to 90 percent of the acid and produced a palatable sirup with little flavor other than that of sweetness. A variable quantity of arsenic was removed by the single treatment. To ensure more complete removal when it becomes necessary, a two-step (cation-anion) or a three-step (anion-cation-anion) exchanger treatment must be used. As much as 96 percent of the arsenic content was removed by the three-step method, and a smaller amount was eliminated by the two-step method. In addition, the cation exchanger removed about 90 percent of the ash.

Changes in stored dried eggs: Source of fluorescence, H. S. OLCOTT and H. J. DURTON. (U. S. D. A.). (*Indus. and Engin. Chem.*, 37 (1945), No. 11, pp. 1119-1121, illus. 1).—The authors note that the fluorescence of 10-percent salt extracts of dried eggs is currently used as a simple criterion of palatability. This fluorescence, the source of which has not been recognized, appears to be due to the brown reaction products of glucose and the free amino groups of proteins. Similar fluorescing brown products also result from the interaction of simple amines and aldehydes. These can be used as model systems for the study of the glucose-protein reaction.

Vapor pressure of water adsorbed on dehydrated eggs, B. MAKOWER. (U. S. D. A.). (*Indus. and Engin. Chem.*, 37 (1945), No. 10, pp. 1018-1022, illus. 4).—Equilibrium pressure of water vapor over spray-dried whole eggs was determined at six temperatures varying from 17.1° to 70° C. and at moisture contents ranging from 0.5 to 5.5 percent. The results agreed well with similar data on eggs dried from the frozen state and with other published data. The results were analyzed by a graphical method, and from this analysis was derived the isosteric heat of adsorption of water on dried eggs at various moisture levels. The ratio of the isosteric heat to the latent heat of condensation of water vapor increases from 1.1 to 2.1 as

the moisture content decreases from 5.5 to 0.5 percent. It was also shown that the adsorption isotherms can be represented, within certain limits, by the Brunauer, Emmett, and Teller theory of adsorption of gases on solids.

La cura de la vainilla [Vanilla curing], F. E. ARANA (*Puerto Rico Sta. Cir. 25* (1945), *Span. ed.*, pp. 22+, *illus.* 9).—The English edition of this circular has been noted (E. S. R., 94, p. 8).

Quantitative saccharification of wood and cellulose, J. F. SAEMAN, J. L. BUBL, and E. E. HARRIS. (U. S. D. A.). (*Indus. and Engin. Chem., Analyt. Ed.*, 17 (1945), No. 1, pp. 35–37).—The authors describe a rapid analytical technic developed for the hydrolysis of cellulosic materials. The method involves treatment of the material with 72-percent sulfuric acid for 45 min. at 30° C., followed by a secondary hydrolysis for 1 hr. in a 15-lb. autoclave or for 4.5 hr. at the boiling point. Data presented show how the yield of reducing sugar varies with the conditions used. A table shows the "potential reducing sugar" content of 15 species of wood and the variation occurring within a species.

Fermentation of wood sugars to ethyl alcohol, R. H. LEONARD and G. J. HAJNY (*Indus. and Engin. Chem.*, 37 (1945), No. 4, pp. 390–395, *illus.* 1).—Fermentation of neutralized wood-sugar liquors was difficult except under special conditions. Acid sugar liquors, which had been treated with lime to a pH of 5 and then heated to 138° C. for a short time before filtering, gave a preparation that fermented anaerobically in 14 to 20 hr. with 2 percent by volume of distiller's yeast. The addition of reducing agents was useful for production of easily fermented wood-sugar preparations.

Thermo-dynamics of producer gas combustion: Application to internal combustion engines, A. P. OLESON and R. WIEBE. (U. S. D. A.). (*Indus. and Engin. Chem.*, 37 (1945), No. 7, pp. 653–660, *illus.* 7).—The composition and heats of combustion of producer gas derived from various raw materials are given. A nomograph is presented for calculating the heats of combustion of producer gas mixtures containing hydrogen, carbon monoxide, and methane. The theoretical air-fuel ratios of producer gas are compared with those of other fuels used in internal combustion engines, and attention is called to their importance in connection with carburetor design. The heat of combustion of a mixture of producer gas with theoretical air was found considerably lower than that of gasoline or alcohol; and lower power output must be expected from such a mixture run under identical conditions with the liquid fuels mentioned above. The thermodynamic properties of two typical producer gas mixtures were calculated, and the results shown on charts. A sample calculation gives temperatures and pressures at various points of the Otto cycle, as well as work, mean effective pressure, and efficiency. The effects of compression ratio and intake-manifold pressure on mean effective pressure and thermal efficiency are shown by charts. It is pointed out that extreme compression ratios are not so practicable for an Otto cycle engine as an increase in manifold pressure, since a relatively low supercharge pressure gives a power output equivalent to that of gasoline. It is noted that it would be possible to use such a fuel in a Diesel gas engine.

Cryptostegia leaf rubber, S. R. HOOVER, T. J. DIETZ, J. NAGHSKI, and J. W. WHITE, JR. (U. S. D. A.). (*Indus. and Engin. Chem.*, 37 (1945), No. 9, pp. 803–809, *illus.* 4).—Investigating the leaves of *C. grandiflora* as a possible emergency source of rubber, supplementary to the latex rubber obtained from the stems of the vine, the authors found the leaf rubber to be of two distinct types. From 85 to 90 percent was a rubber of relatively low degree of polymerization, occurring in the chlorenchyma cells. From 10 to 15 percent was a latex rubber of a better quality, found in latex ducts. Isolation of the leaf rubber by a combination of fermentation and chemical extraction, and the characterization of vulcanizates are described. Extensive experiments on the microbiological phase of the process led to an anaerobic

fermentation by *Clostridium roseum* in which more than 60 percent of the dry weight of the leaves was digested and the leaves were well digested and disintegrated after a 2-day incubation. Passage over a vibrating 80-mesh screen separated a liquid containing the cell protoplasts, carrying the greater part of the rubber, from a bagasse of cuticle, veins, and small stems. An alkali cook process and a benzene extraction method for the recovery of the rubber from the cell-contents thus separated are described, together with preparation and testing of vulcanized blends of the leaf rubber with GR-S.

Artificial bristles from proteins, T. L. McMEEKIN, T. S. REID, R. C. WARNER, and R. W. JACKSON. (U. S. D. A.). (*Indus. and Engin. Chem.*, 37 (1944), No. 7, pp. 685-688, illus. 7).—The authors describe a method for producing coarse fibers from casein by extruding a heated mixture of casein and water through a suitable die. When the fiber was stretched and hardened, under tension, with quinone, a bristle material was obtained. This was tested in certain types of brushes.

Textile fiber from casein: Factors affecting the tensile strength, R. F. PETERSON, T. P. CALDWELL, N. J. HIPPI, R. HELLBACH, and R. W. JACKSON. (U. S. D. A.). (*Indus. and Engin. Chem.*, 37 (1945), No. 5, pp. 492-496, illus. 1).—The authors report experiments on the preparation of fibers from acid-precipitated casein with a laboratory spinning machine, attention having been directed to the major operations of fiber production—namely, dissolving the casein, spinning, stretching, and hardening. A spinning solution containing 20 percent protein and having a pH of 9.2 was employed in most of the experiments. All fibers were given a final hardening treatment with formaldehyde. Stretching the tow issuing from the spinnerette, either in the precipitating bath or between godet wheels in air, gave a tensile strength of about 0.7 gm. per denier. Under these conditions of stretching, the addition of aluminum sulfate to the precipitating bath containing sulfuric acid and sodium sulfate did not affect the strength of the fiber. Such incorporation of aluminum sulfate had a marked effect in a subsequent operation involving simultaneous stretching and partial hardening with formaldehyde, however. When the latter process was operated at 85° C., a dry strength of 1 gm. per denier and a wet strength of 0.5 gm. per denier were obtained. It was found that comparative measurements of tensile strength of artificial protein fibers which will be exposed to moisture are best made after the fibers have been swollen in water and dried.

Fermentation process for itaconic acid, L. B. LOCKWOOD and G. E. WARD. (U. S. D. A.). (*Indus. and Engin. Chem.*, 37 (1945), No. 4, pp. 405-406).—A fermentation process for the production of itaconic acid based on the cultivation of a superior strain of *Aspergillus terreus* (designated NRRL 1960) on the surface of glucose nutrient media, was developed and operated on a semipilot plant scale. Itaconic acid yielded in excess of 30 gm. per 100 gm. of glucose supplied were obtained in 12 days. The major portion of itaconic acid produced can be recovered by crystallization after concentrating and cooling the filtered liquors. The fermentation was resistant to contamination, since the nutrient medium was maintained at a low pH level throughout the culture period.

Peanut protein hydrates: Preparation and properties, R. S. BURNETT. (U. S. D. A.). (*Indus. and Engin. Chem.*, 37 (1945), No. 9, pp. 861-864, illus. 2).—The authors describe hydrated preparations of the peanut proteins said to be capable of binding increasing amounts of water, from 38 to about 70 percent by weight of the sol, as the pH value of the system was increased from 4.5 to 9.0. The presence of water in excess of that bound by the protein resulted in disintegration of the protein-water system. The protein hydrates were tacky and, at pH values near neutrality, had viscosity characteristics which made them suitable for use as adhesives, provided the protein used was isolated from the meal with a minimum of alteration by heat or alkali. Precipitated and filtered peanut protein curds were dewatered by warm-

ing until the curd particles coalesced and excluded unbound water. This reduction of the water content from 70-80 to about 40 percent greatly reduced drying costs in preparing isolated peanut protein. Similar hydrates can be prepared from isolated soybean protein.

Peanut protein hydrates: Utilization as tacky and remoistening adhesives, R. S. BURNETT, E. D. PARKER, and E. J. ROBERTS. (U. S. D. A.). (*Indus. and Engin. Chem.*, 37 (1945), No. 10, pp. 980-982).—The authors prepared glues from peanut proteins obtained both from solvent-extracted and from hydraulically pressed meals. These products were found suitable for making gummed tape and paper and for making flexible glues of the type used by the set-up paper-box maker and the bookbinder. Preliminary investigations indicated that gummed tapes with relatively good adhesive strengths could be prepared from peanut protein glues. Peanut protein flexible glues were relatively free of difficulties encountered with certain other types because they could be applied cold and became tacky immediately. Readily soluble glues could be prepared from isoelectric peanut protein curds by neutralizing the curds before they were dried. Dewatering peanut protein curds to the water content required in the hydrate reduced drying costs and provided a glue of relatively uniform ash content. The characteristics of these peanut protein glues, particularly rewettability, tackiness, and flow properties, rendered them suitable for certain gluing purposes for which vegetable proteins had previously been considered unsuitable.

A comparison of Sicilian and three American species of sumac for tanning sheepskin skivers, I. D. CLARKE, C. W. MANN, and J. S. ROGERS. (U. S. D. A.). (*Jour. Amer. Leather Chem. Assoc.*, 41 (1946), No. 2, pp. 57-79).—Fifteen packs of sheepskin skivers were tanned with four lots of *Rhus copallina* leaves, two of *R. glabra* leaves, three of *R. glabra* leaflets, two of *R. typhina* leaves, two of *R. typhina* leaflets, and two of ground Sicilian sumac. Satisfactory commercial leather was produced by all, though some were so low in tannin that it was necessary to reduce the number of skivers in the pack below the normal 30 doz. None of the lots of domestic sumac gave leather quite equal to that produced by Sicilian sumac. The order of preference, as expressed by the tanner, was *R. coriaria* (Sicilian), *R. copallina*, *R. typhina*, and *R. glabra*.

Recovery of 2,3-butylene glycol from fermentation liquors, R. H. BLOM, D. L. REED, A. EFRON, and G. C. MUSTAKAS. (U. S. D. A.). (*Indus. and Engin. Chem.*, 37 (1944), No. 9, pp. 865-870, illus. 6).—A possible industrial source of butadiene is 2,3-butylene glycol, produced by the fermentation of cereal grains. The recovery of butylene glycol from a fermentation liquor is difficult because of its comparative high boiling point and the presence in the liquor of 2 parts of non-volatile solids to 1 part of glycol. This paper reports upon a recovery process in which a concentrated liquor is steam-stripped in a packed column at an elevated pressure. Experimental work underlying this step of the process is described.

Liquid-vapor equilibrium in mixtures of 2,3-butylene glycol and water, R. H. BLOM, G. C. MUSTAKAS, A. EFRON, and D. L. REED. (U. S. D. A.). (*Indus. and Engin. Chem.*, 37 (1945), No. 9, pp. 870-872, illus. 3).—The authors made liquid-vapor equilibrium measurements for meso-2,3-butylene glycol-water system at pressures and concentrations covering the ranges to be encountered in the recovery of glycol from fermentation liquors. They prepared from these data a chart which shows vapor composition as a function of pressure for certain arbitrarily chosen liquid concentrations. The chart was found to have an accuracy sufficient for engineering design calculations.

Continuous process for acetylation of 2,3-butylene glycol, L. E. SCHNIEPP, J. W. DUNNING, and E. C. LATHROP. (U. S. D. A.). (*Indus. and Engin. Chem.*, 37 (1944), No. 9, pp. 872-877, illus. 4).—A practical continuous process for 2,3-butylene glycol diacetate consisted in feeding the glycol, along with a catalytic quan-

tity of sulfuric acid, into the top of a reaction column while introducing a continuous stream of glacial acetic acid into the base of the column. Temperatures of 140°–150° C. were maintained in the zone between the feeds. The column distillate, consisting of acetic acid, water, and traces of methyl ethyl ketone, was dehydrated in an auxiliary column, and the acetic acid returned to the esterification feed. The base product from the reaction column consisted of glycol diacetate, acetic acid, and sulfuric acid esters of glycol. This mixture was separated by vacuum fractional distillation, the acetic acid and sulfuric acid esters being returned to the esterification column as feed and catalyst, respectively. The glycol diacetate so produced was of high quality and suitable for conversion to butadiene by pyrolysis. 2,3-Butylene glycol diacetate was produced in 97 percent yield; 3 percent of the glycol was converted to methyl ethyl ketone, and the excess acetic acid was recovered quantitatively. This procedure was found applicable to the production of other high-boiling acetates.

Conversion of 2,3-butylene glycol to 1,3-butadiene by pyrolysis of diacetate, S. A. MORELL, H. H. GELLER, and E. C. LATHROP. (U. S. D. A.). (*Indus. and Engin. Chem.*, 37 (1945), No. 9, pp. 877–884, illus. 2).—The conversion of 2,3-butylene glycol to butadiene by pyrolysis of its diacetate was studied over a wide range of temperatures and contact times. Yields of 82 percent of butadiene (purity, 99 percent) were obtained on one-pass pyrolyses in the temperature range 575° to 600° C. An additional 5 percent was secured by isolation and pyrolysis of the intermediates left in the pyrolysis liquors. Acetic acid recoveries of 99 percent were obtained under optimum conditions. Methyl vinyl carbonyl and crotyl acetates were identified as the intermediates of the reaction. The main byproducts were methyl ethyl ketone, methyl ethyl ketone enol-acetate (2-acetoxy-2-butene), and methyl acetyl acetone.

Pilot-plant conversion of 2,3-butylene glycol diacetate to 1,3-butadiene, L. E. SCHNIEPP, J. W. DUNNING, H. H. GELLER, S. A. MORELL, and E. C. LATHROP. (U. S. D. A.). (*Indus. and Engin. Chem.*, 37 (1945), No. 9, pp. 884–889, illus. 5).—Pilot-plant studies of the process for producing 1,3-butadiene from 2,3-butylene glycol diacetate by pyrolysis showed an 88 percent yield. The process consisted in pyrolyzing the diacetate at 595° C. to obtain an 83 percent conversion to 99+ percent pure butadiene. The intermediate butenol acetates were separated from the acetic acid of the pyrolysis liquors and repyrolyzed to obtain the additional 5 percent of butadiene. Approximately 8 percent of useful byproducts were obtained. These consisted of methyl ethyl ketone, methyl ethyl ketone enol-acetate (2-acetoxy-2-butene), and methyl acetyl acetone, the latter two being hydrolyzable to methyl ethyl ketone and acetic acid. The over-all acetic acid recovery was 99 percent, and 0.8 percent of the initial diacetate was converted to vent gases. A proposed continuous process for production of butadiene from 2,3-butylene glycol is described briefly.

Iron pentacarbonyl as antiknock agent in alcohol motor fuels, I. PITESKY and R. WIEBE. (U. S. D. A.). (*Indus. and Engin. Chem.*, 37 (1945), No. 6, pp. 577–579).—Iron pentacarbonyl was found an effective antiknock agent for ethyl alcohol fuels, but caution had to be observed when it was used in motor fuels, since the iron oxide deposit may seriously interfere with engine operation. The action of light changed iron pentacarbonyl to iron enneacarbonyl which was practically insoluble in hydrocarbon fuels. Iron enneacarbonyl, however, was soluble in ethyl alcohol, at least to the extent tested, and no obnoxious precipitate occurred in this fuel. Small quantities of oleic, palmitic, or stearic acids or of triethanolamine oleate were effective stabilizers for the iron pentacarbonyl in some hydrocarbon fuels. For solutions in anhydrous ethyl alcohol and in ethyl alcohol containing 5 percent water by volume, no stabilizer was necessary. If reasonable precautions were observed,

working with iron pentacarbonyl appeared no more dangerous from a health standpoint than the use of tetraethyl lead.

Solubility of water in alcohol-hydrocarbon mixtures, C. B. KRETSCHMER and R. WIEBE. (U. S. D. A.). (*Indus. and Engin. Chem.*, 37 (1945), No. 11, pp. 1130-1132).—The solubility of water in mixtures of ethyl alcohol with paraffin hydrocarbons was found to decrease with increase in the molecular weight of the hydrocarbon. As this rule appears to hold also for naphthenes and olefins, and similar observations upon the aromatic hydrocarbons have been recorded, the more volatile gasolines may be said generally to have the higher water tolerances. With the exception of distillate fuels, the solubility of water in ethyl alcohol-hydrocarbon blends or, in general, in ethyl alcohol-gasoline blends is large enough so that if reasonable precautions are observed, no trouble from this source should be experienced. This has been found generally to hold for mixtures containing 10 percent or more of alcohol. Storage above water, required by law in some parts of the country, would be impossible because of the fuel loss due to dissolving out of the alcohol by the water. Unless higher alcohols are present in ethyl alcohol as a denaturant or in consequence of the method of production, it would not seem practical to add them in order to increase the solubility of water in blends. If necessary, this might be better accomplished by the further addition of ethyl alcohol.

Evaluation of malts for production of alcohol from wheat, C. B. THORNE, R. L. EMERSON, W. J. OLSON, and W. H. PETERSON. (Wis. Expt. Sta.). (*Indus. and Engin. Chem.*, 37 (1945), No. 11, pp. 1142-1144).—The authors find that knowledge of the amylase content of a malt is helpful but is not adequate for complete evaluation of the malt. Other factors also operate, and probably only a fermentation test can give an accurate evaluation. A possible method for evaluating malts for production of alcohol from wheat is to employ a 5 percent level of malt in a 36-hr. fermentation. If two fermentations are run, 24- and 72-hr. periods give both the rate of conversion and the final degree of conversion of the wheat starch to alcohol. In laboratory fermentations of wheat, malt in the amount of 8 percent of the total grain bill, as commonly used in industrial plants, was found to be in excess. Many malts at a 5 percent level gave maximum yields of alcohol in 36 hr. Under the conditions employed, the limiting factor in speed of fermentation appeared to be the action of the malt rather than the fermenting power of the yeast.

Conversion of "percentage concentration" of mash or beer to gallonage, F. M. BURDICK and J. CORMAN. (U. S. D. A.). (*Indus. and Engin. Chem., Analyt. Ed.*, 17 (1945), No. 4, p. 268).—Percentage concentration is the weight, in grams, of original grains contained in 100 cc. of final slurry. "Gallonage" is the volume, in U. S. gallons, of final slurry which contains one U. S. distillers' bushel of original grains. The authors point out that the relation between the two expressions of mash concentration is such that the percentage concentration multiplied by the gallonage is equal to the constant 671.04, so that either expression is obtainable by dividing the specified constant by the other.

AGRICULTURAL METEROLOGY

The sun makes the weather.—I, Measuring solar variation. II, Weather effects of solar variation, C. G. ABBOT (*Sci. Mo.*, 62 (1946), Nos. 3, pp. 201-210, illus. 10; 4, pp. 341-348, illus. 3).—This is a semipopular account of the author's investigations of the past 25 yr. on three problems: "How much does the sun's heat that warms the earth change from time to time? How much do these heat changes affect the weather? Can sun-produced weather changes be predicted?"

* **Reduction of radio interference from meteorological installations**, R. L. IVES (*Amer. Met. Soc. Bul.*, 27 (1946), No. 2, pp. 59-61, illus. 3).—Increasing electrifica-

tion of meteorological apparatus—accompanied by a greatly expanded use of radio equipment, often in the near vicinity—has created an interference situation that is rapidly becoming acute. Fortunately, its reduction to a very low level is in most cases both simple and inexpensive; general methods are here outlined. The installation of a relatively large number of spark absorbers and radio frequency filters indicates that the devices described are not only effective in reducing interference, but that they also protect the entire installation from break-downs due to line surges at various potentials and frequencies. It is recommended that manufacturers of meteorological equipment check their designs and make such modifications as are necessary to minimize radio interference.

Field-type soil thermometers, R. L. IVES (*Amer. Met. Soc. Bul.*, 27 (1946), No. 2, pp. 69-70, illus. 2).—Mounting an "industrial type" metallic thermometer in a mechanically rugged thermally insulated supporting and protecting frame produced a soil thermometer said to give considerable accuracy and to be immune to most forms of field damage. The apparatus is described and illustrated.

Variation in physical properties and in atmospheric concentration of hail, N. C. GERSON (*Amer. Met. Soc. Bul.*, 27 (1946), No. 2, pp. 47-53, illus. 1).—The author discusses the common range and frequency distribution of size in hail as reported for India, central Europe, and the United States; the shape, temperature, degree of wetness, and horizontal and vertical distribution of hail in the atmosphere; and the duration of hailstorms. There are 12 references.

Thunderstorms and the freezing level, N. R. BEERS (*Amer. Met. Soc. Bul.*, 27 (1946), No. 2, pp. 54-58, illus. 2).—The developments presented are thermodynamical in character. It is shown that phase changes from water to ice or snow produce large accelerations in ascending air provided the phase change occurs within a level of accumulation not too thick—i. e., if the phase change actually raises the temperature of the ascending air above that of its environment. It is believed that this discussion clarifies the problem of thunderstorm forecasting by emphasizing the importance of the freezing level. Observation and a dynamical theory of thunderstorm formation are, however, still required. Observations are needed of temperature, three-dimensional wind, water content, and impurities both within and without ascending columns and both before and after the cloud is formed. Controlled tests with supercooled water and air may afford information on the rate of phase changes; statistical studies should also illuminate the situation. "In fine the problem of thunderstorms and the freezing level is admittedly not yet completely solved; the writer's sole excuse for publication of these preliminary results is that they have been useful in making daily weather forecasts during the summer of 1945."

Injury and death or recovery of trees in prairie climate, F. W. ALBERTSON and J. E. WEAVER. (Univ. Nebr. et al.). (*Ecol. Monog.*, 15 (1945), No. 4, pp. 393-433, illus. 62).—This study—involving data from a wide range of sources—describes the effects of the greatest drought since the beginning of recorded weather history on forests and trees under a prairie climate. A major area of postclimax forest occurs along the Missouri River, where the red oak-linden community is the most mesic, black oak-shagbark hickory is intermediate, and bur oak-bitternut hickory is the most xeric. Communities of shrubs are often transitional from forest to prairie. In Nebraska, as elsewhere, all these forests suffered heavily from drought, especially when pastured. Decreases in size of individual trees and number of species and confinement to the most protected sites are marked northward, and especially westward where the climate becomes more arid. Along prairie streams westward from the Missouri River, forest communities rapidly disappear; farther westward, trees are largely confined to the banks of the larger streams, broad shallow ravines, and the vicinity of springs. Several years of decreasing precipitation initiated the 7 yr.

of drought; the 12 mo. following June 1943 had the driest weather ever recorded in the prairie region. The early effects were very impressive and widely reported as revealed in the literature (44 references).

Pre-drought data on mean annual precipitation, average weekly evaporation, and water content of soil from Nebraska, Kansas, and Colorado are presented. The chief cause of injury was lack of sufficient available water due to low precipitation but accentuated by one or more of several causes, such as competition for water by grasses, decreased rate of water infiltration and rapid run-off, drying up of streams and springs, rapid fall of the water table, low humidity, high evaporation, desiccating winds, and the inability of trees to accommodate their root systems to the rapidly changing environment. Experimental data on the harmful effects of competition with grass on both roots and shoots of trees are given in detail. Injury and death of woody plants by the drought often resulted from continuous adverse conditions over an extended period. Exposure of branches with reduced foliage to high insolation, great heat, and low humidity was a common cause of injury. Destruction in long-established timber claims was also high, and losses in windbreaks were nearly always heavy—with dust storms a contributory factor. Average losses of trees in Nebraska and Kansas were probably 50 to 60 percent by death, with severe to moderate injury in an additional 20 to 25 percent. The effects of drought on the radial growth of uninjured or least injured trees of various species in western Kansas are described. Trees retaining some life at the close of the drought usually remained alive temporarily unless already nearly dead or heavily infested by borers; recovery was principally through locally renewed growth within the crown. Sprouts developing from the bases of certain trees grew rapidly. Seedlings were not found in timber claims, windbreaks, or hedgerows in mixed prairie and only rarely in unpastured places east of the Missouri River. The findings from this monographic study are presented in great detail.

The agricultural climatology, vegetative cover, and crop ecology of the Ukraine and the Ukrainian climatic analogues in North America, M. Y. NUTTONSON (*U. S. Dept. Agr., Off. Foreign Agr. Relat.*, 1946, pp. 23+, illus. 1).—This processed report—along lines similar to those previously noted (*E. S. R.*, 93, p. 121)—represents an agroclimatic and crop-ecological approach by an agronomist to plant introduction and exchange of plant material between the Ukraine and North America; it is a direct offshoot from problems of the huge postwar agronomic plant introduction tasks, but its background is also an outgrowth of some of the nonemergency experiences where careful varietal field trials of introduced plant material have been possible. From a purely regional viewpoint there is often need for crop diversification and improvement, as well as for economy in time, effort, and cost of varietal field trials. The particular object of this contribution is to organize, define, and analyze the various distinct agroclimatic conditions in different parts of the Ukraine and to compare them with similar conditions in North America in order to ascertain the "climatic analogs" of the two areas.

Climatology of Norway and its climate parallels in North America, M. Y. NUTTONSON (*U. S. Dept. Agr., Off. Foreign Agr. Relat.*, 1945, pp. 6+, illus. 1).—This study of Norway follows essentially the same approach as that followed for other European countries and previously noted (see preceding entry).

Kansas weather, 1945, S. D. FLORA (*Kans. Acad. Sci. Trans.*, 48 (1946), No. 4, pp. 394-408, illus. 13).—In addition to data on the severe windstorms, hail, and overflows in streams of the State for the year, the author summarizes the weather data of 1945 by months.

The 1945 crop season in North Dakota, H. L. WALSTER ET AL. (*North Dakota Sta. Bimo. Bul.*, 8 (1946), No. 3, pp. 3-9).—The growing season of 1945 in the State differed in so many ways from the usual conditions likely to occur over an average of

a long period of years that it seemed wise to publish rather detailed discussions. These include meteorological and crop conditions throughout the State; seeding dates at Fargo, Dickinson, and on the upland and irrigation stations at Williston; the crop season at Dickinson, Edgeley, Langdon, and Williston; and seasonal conditions at Minot and Hettinger.

Report on the phenological observations in the British Isles from December 1944 to October 1945, H. C. GUNTON (*Roy. Met. Soc. [London], Quart. Jour.*, 72 (1946), *Sup.*, pp. 43, *illus.* 4).—A further report (*E. S. R.*, 93, p. 121).

Climate and insect life, C. B. WILLIAMS (*Nature [London]*, 157 (1946), *No.* 3982, pp. 214–215, *illus.* 1).—A brief general statement as to the factors involved in the bioclimatics of insect life and the present state of the problems concerned, as suggested at a joint meeting of the Royal Meteorological Society and the Royal Entomological Society in London on June 20, 1945.

SOILS—FERTILIZERS

The rôle of clay minerals in the formation of soil structure, J. B. PETERSON. (Iowa Expt. Sta.). (*Soil Sci.*, 61 (1946), *No.* 3, pp. 247–256, *illus.* 5).—In experiments upon measurement of the relative capacity of kaolinite and montmorillonite to form water-stable aggregates under the influence of cyclic wetting and drying, the kaolinite was found to be very inert as a binding agent, having little effect on aggregation. Montmorillonite formed gel-like globules which varied in resistance to dispersion in water according to the conditions of the experiment. The difference in behavior of the two clays was attributed to the greater surface, hydration, and charge of the montmorillonite in comparison with the kaolinite. Kaolinite had no apparent effect on the state of aggregation that developed in a puddled Tama soil. Montmorillonite increased markedly the proportion of the mixture resistant to wet-sieving when the clay mineral was added in a quantity sufficient to constitute it the predominating component. When mixtures of sand and either clay treated with various quantities of ground alfalfa were incubated for 1 mo. before puddling and then exposed to cyclic wetting and drying, the alfalfa had no effect on the proportion of the material resistant to dispersion in water. Hydrous ferric oxide had no effect on the aggregation of kaolinite and sand. When quantities of this oxide equivalent to 1.5 percent of the dry weight of the mixture were added, the amount of montmorillonite gel remaining on the screens decreased, possibly through the mechanism of mutual flocculation. Small additions of sand to mixtures of kaolinite and montmorillonite increased the resistance of the mixtures to dispersion in water. Larger proportions of sand had a reverse effect.

Mineralogy of some soils from Denmark, Western Australia, D. CARROLL. (*Soil Sci.*, 60 (1945), *No.* 6, pp. 413–426, *illus.* 1).—A disease of stock, affecting especially dairy cows and sheep, was found to be confined to certain land holdings, adjacent properties being not only free from the disorder but capable of curing it when the affected animals were transferred to them. Locally known as "Denmark wasting disease" or enzootic marasmus, the trouble was traced to cobalt deficiency. A detailed examination of the soils concerned, their mineralogical composition, and their geological origins, is here reported. Two soil series derived from dolerite and schists, an area designated alluvial and wash, and laterite boulder areas referred to as "various" parent rock origins were free from the cobalt deficiency disorder. Three soils derived from gneiss materials and one originating from gneiss, quartzite, and transported sand showed the deficiency, as did also a transported sand and a sand derived from sillimanite schist.

Some effects of freezing and thawing on the aggregation and permeability of dispersed soils, R. GARDNER. (Colo. Expt. Sta.). (*Soil Sci.*, 60 (1945), *No.* 6,

pp. 437-443, illus. 2).—Compaction and dehydration of semidispersed soils between the faces of adjacent ice crystals produced a stable flaky soil structure in soils with a high percentage of replaceable calcium and an unstable flaky soil structure in soils high in replaceable sodium. Freezing and thawing did not restore permeability to impermeable sodium-saturated soils. Replacing the sodium ions in sodium-saturated soils with calcium ions without freezing did not restore permeability, but freezing after calcium chloride was added to replace the sodium ions did so. It is concluded that freezing and thawing may be utilized to good advantage in cold climates as aids in restoring structure and permeability in the process of reclaiming soils that have been injured by sodium salts.

Increase made in soil testing, R. COWART (*Miss. Farm Res. [Mississippi Sta.], 9 (1946), No. 1, p. 6*).—A soil testing service recently instituted received about 800 samples during the first year and a larger number during the first half of its second year, July 1, 1945, to January 1, 1946. Under conditions of excessive rainfall, the farmer is advised to delay sampling until the soil is no longer waterlogged. Soil dry enough for cultivating is considered to be probably in the best state for sampling.

Comparison of four methods of soil moisture measurement, C. S. SLATER and J. C. BRYANT. (U. S. D. A. coop. Md. Expt. Sta.). (*Soil Sci., 61 (1946), No. 2, pp. 131-155, illus. 7*).—The authors compared, under field conditions, the behavior of tensiometers (E. S. R., 79, p. 159), resistance blocks (E. S. R., 82, p. 307), and gravimetric plugs. The performances of the instruments were judged by moisture determinations on soil samples that were taken at random within a restricted area around each instrument installation.

The three instruments were found to differ with respect to the accuracy with which they measured soil moisture, the ranges of moisture in which the instruments were sensitive, and their efficiencies in differentiating soil moisture levels. On a silt loam soil, the plugs and blocks were superior to the tensiometers with respect to errors of estimate and range of operation but were insensitive to moisture changes in a range of higher moisture contents where the tensiometers gave their best performance. On a silt loam soil the plugs were better than the blocks with respect to errors of estimate, efficiencies of differentiation, and location of their sensitive ranges on an available moisture scale. On a very sandy soil the blocks appeared to be better than the plugs in all respects, although the performance of neither instrument was satisfactory throughout the available moisture range.

"The results of the experiment as a whole indicate clearly that no one instrument is 'best' in its present state of development. The choice of method for measuring soil moisture should be based on differences in the conditions of measurement as well as on instrument characteristics. It is the opinion of the writers that tensiometers are decidedly limited in usefulness, that under a majority of soil conditions gravimetric plugs are best adapted to accurate measurement, and that resistance blocks are best adapted to semiquantitative measurements of the variable field moisture of large areas under conditions that do not require the improved accuracy that can be obtained by temperature corrections."

Changes in construction of soil moisture tensiometers for field use, A. S. HUNTER and O. J. KELLEY. (U. S. D. A.). (*Soil Sci., 61 (1946), No. 3, pp. 215-217, illus. 1*).—Tensiometers of the vacuum-gauge type were found too sluggish in their response and to present difficulties in maintenance. Mercury-manometer tensiometers, though very useful for following changes in soil moisture content within their range, had to be made from 3 to 4 ft. high, with the result that cultivating implements could not pass over them. Removal and replacement of the instruments at each cultivation was considered not only to be too laborious and time-consuming but also to have nonmeasurable effects both upon roots near the tensiometer cup and upon moisture equilibria. The channel iron support carrying the glass manometer tubing and its scale was therefore hinged directly over the mercury reservoir, and

a short length of a flexible tubing was inserted between the copper capillary tubing leading to the cup and the manometer tubing. A short bar rigidly attached to the side of the upper part of the channel iron support and capable of being locked in the vertical position by a cotter pin passing through it and the lower part of the support completed the mechanism, permitting the support to be laid over level with the ground. A coil in the copper tubing at the top of the instrument permitted a movement of the glass manometer capillary sufficient to allow it to be raised from the mercury container. The mercury had to be run back into its reservoir before the frame of the instrument was folded over, and the instrument reset when replaced in operating position.

The integrated soil moisture stress upon a root system in a large container of saline soil. C. H. WADLEIGH. (U. S. D. A. coop. 11 western States et al.). (*Soil Sci.*, 61 (1946), No. 3, pp. 225-238, illus. 8).—A mathematical method for evaluating the variations in energy content of the soil moisture being absorbed by a plant grown in a large container of saline soil is presented. The method takes into account variability in salt distribution within the soil, variations in moisture distribution of the soil at a given time, and variation in total moisture content with time. A discussion of the errors involved is included.

Effect of moisture content on the dissolved and exchangeable ions of soils of arid regions. R. F. REITEMEIER. (U. S. D. A. coop. 11 western States et al.). (*Soil Sci.*, 61 (1946), No. 3, pp. 195-214, illus. 7).—Dissolved ions of six soils were determined at field moisture content, saturation percentage, 200 percent, and 500 percent. The ions included Ca, Mg, Na, K, NH_4 , $\text{CO}_3\text{-HCO}_3$, SO_4 , Cl, NO_3 , and PO_4 . The soils contained varying quantities of soluble salts, alkaline earth carbonates, and gypsum. The exchangeable base status at each moisture content was determined by ammonium acetate extraction and calculations based on cation-exchange equilibria.

With the exception of sulfate in one soil, all soluble ion contents in all soils changed to some degree on dilution. Sodium, K, NH_4 , $\text{CO}_3\text{-HCO}_3$, PO_4 , and SO_4 (with the exception noted) increased in all soils with increasing moisture content. Calcium and magnesium increased in four soils, passed through maxima in one soil, and decreased continuously in one. The increases in these eight ions are explained by ion exchanges and solution of solid compounds on the basis of additional amounts of water. The decreases in Ca and Mg were found to result from a cation valence dilution effect whereby, on dilution, soluble Ca and Mg replace exchangeable Na, K, and NH_4 from the soil colloids. Chloride and nitrate decreased continuously in all soils; the average reduction in the two ions was 28 and 23 percent, respectively. Possible explanations of the decreased concentrations of these ions are suggested. Exchangeable sodium decreased continuously on dilution, by from 32 to 58 percent. The ratio of exchangeable calcium to magnesium in the two gypsiferous soils increased greatly on dilution.

It is recommended that the soluble salts of arid soils be determined at a moisture content near that at which the results are to be interpreted. In soils having appreciable contents of mixed soluble salts, the determined exchangeable-base status was found to apply only to the moisture content at which the soluble salts are determined. The theoretical and experimental aspects of the various cation and anion phenomena led to the conclusion that the soil solution cannot be homogeneous throughout its entire mass and generally is less concentrated near the soil colloidal particles.

Microorganisms and soil aggregation.—II, Influence of bacterial polysaccharides on soil structure. J. P. MARTIN. (Idaho Expt. Sta.). (*Soil Sci.*, 61 (1946), No. 2, pp. 157-166, illus. 1).—The present paper deals with the effects of the polysaccharides produced by six bacterial strains in addition to the one organism found an effective soil aggregating agent, and discussed in the first paper (E. S. R., 94, p. 20) of the series.

Six bacterial polysaccharides, three fructosans and three dextrans, were prepared

in quantity and their influence on soil aggregation and slaking was determined. The effectiveness of the different preparations varied but was very marked in all cases. The polysaccharides alone had a greater influence than the casein or lignin with which they were compared. In combination with lignin and casein, they influenced soil structure quite as beneficially as when used alone. The bacterial polysaccharides, in general, were attacked to a limited extent by micro-organisms. At least one and usually several microbes were capable of utilizing each, however.

Dynamics of wind erosion, III-V. W. S. CHEPIL (*Soil Sci.*, 60 (1945), No. 6, pp. 475-480, illus. 3; 61 (1946), Nos. 2, pp. 167-177, illus. 5; 3, pp. 257-263, illus. 1).—Continuing this series (E. S. R., 94, p. 594), paper 3 is concerned specifically with the relationship between the velocity of a wind and the rate of removal of the soil, paper 4 with five forms of wind erosion, and paper 5 with cumulative intensity of soil movement.

III. *The transport capacity of the wind* (pp. 475-480).—Equations given in an introductory analysis of the problem show that a decrease of 10° C. in the air temperature will increase the density of the air (and concomitantly, the force of a wind) to an extent depending upon the original temperature, but only from 2.5 to 4 percent; that an increase of 10 mm. of mercury in the air pressure will increase its density only by about 1.3 percent; and that changes in air humidity will seldom affect erosive force to a degree in excess of 3 percent. The effect of small changes in velocity, however, was found to have a much greater effect upon erosivity.

The rate of movement of the soil in saltation, in suspension, and in surface creep was shown to vary as the cube of the drag velocity of the wind, the experiments in which this relationship was determined having been carried out in a portable field wind tunnel provided with six Pitot tubes and a specially designed multiple alcohol manometer for simultaneous readings of wind velocity at various heights. In open-field measurements, wide variations in the degree of gustiness of the wind made any determination of the relationship between wind velocity and soil movement very difficult. The relation between the velocity, v , at any height, z , and the drag velocity, V' , was found to conform to the equation: $v_z = 5.75 V' * \log \frac{z}{k}$, in which

k is the height at which the projected curves indicate the velocity to be zero. Since the velocity and the log-height have a straight-line relationship, $V' * \log$ determines the slope of the velocity distribution curves.

IV. *The translocating and abrasive action of the wind* (pp. 167-177).—It is shown that arable soils are affected by five forms of wind erosion—effluxion, extrusion, detrusion, efflation, and abrasion. All, or some, of these forms may affect the soil simultaneously, but none of the other forms occurs on any appreciable scale without effluxion. Therefore, prevention and control of wind erosion should be based mainly on prevention of erosion by effluxion.

Effluxion is defined as removal of soil grains ranging from 0.1 to 0.5 mm. in diameter, initiated and maintained by the direct pressure of the wind. The removal is almost entirely by saltation, but a minor proportion of the soil may be removed in surface creep and some fine particles may be picked up directly by the wind and carried away in true suspension.

V. *Cumulative intensity of soil drifting across eroding fields* (pp. 257-263).—The steadily increasing amounts of erosive particles, the cumulative degree of abrasion, and the gradual decrease in surface roughness along the direction of the wind were found to be the main causes for the gradual increase in the rate of soil movement with distance away from the windward edge of eroding fields. The data indicate that there was much sorting of the soil particles by the wind in accordance with their sizes, the coarser particles tending to remain nearer the windward edge, the finer tending to accumulate nearer the leeward. Causes for the variations in the rate

of increase of soil flow on different soil types and the relationship between these variations and the strip-farming method of soil-drifting control are given.

Evidences of the effect of erosion on the organic matter and erodibility of Honeoye soil, G. R. FREE. (U. S. D. A. coop. [N. Y.] Cornell Expt. Sta.). (*Jour. Amer. Soc. Agron.*, 38 (1946), No. 3, pp. 207-217, *illus.* 3).—Soil loss, runoff, and organic matter data which show evidences of the effect of erosion on the organic matter and erodibility of the highly productive Honeoye soil at Marcellus, N. Y., are presented.

Marked and significant differences in erodibility were found under a uniform treatment following practices which permitted great differences in the amount of erosion. The percentage of organic matter was found to have dropped about 0.002 percent per ton of soil eroded. When the relationship shown by data from land slopes of 9 percent and 4 percent which had not suffered excessive erosion in the past was extended to a 17-percent slope, it was found that the effect of land slope per se upon soil and water losses during the summer period accounted for only about one-eighth of the measured soil losses and about one-third of the measured surface runoff. The remainder could only be attributed to the effects of past erosion. Length of slope was found to be a major factor determining the degree of the erosion on the 17-percent slope which had suffered excessive erosion in the past. The effect of length of slope was less on the 9-percent slope and tended to disappear entirely on the 5-percent slope for the range of lengths of slope included in the study.

Straw mulch for soil improvement, R. E. STEPHENSON and C. E. SCHUSTER. (Oreg. Expt. Sta.). (*Soil Sci.*, 61 (1946), No. 3, pp. 219-224).—The authors report pot experiments on soils subjected for 5 yr. to (1) a 6-in. mulch of wheat straw; (2) volunteer growth sod; and (3) scraping sufficient to prevent all growth.

Growth of sunflower as an indicator plant in soil taken from the top 2 in. under a straw mulch was appreciably greater than in soil taken from sod or a scraped plot. The straw-mulched soil maintained its lead in promoting plant growth after liberal fertilization of all the soils to correct nutrient deficiencies. The straw-mulched soil contained the most acid-soluble potassium, was richest in humus, and had much the highest proportion of aggregates larger than 1.0 mm. diameter.

Influence of fertilizers on the yield and composition of certain crops and on the soil, J. E. GREAVES and D. W. PITTMAN. (Utah State Agr. Col.). (*Soil Sci.*, 61 (1946), No. 3, pp. 239-246).—Commercial fertilizers and manures carrying soluble nitrogen and phosphorus materially increased the yields of potatoes, sugar beets, wheat, and barley on a highly calcareous soil under irrigation. The percentages of phosphorus were increased in all crops, and nitrogen in all crops except alfalfa. Ammonium sulfate in the fertilizers slightly increased the sulfur content of the alfalfa. All fertilizers were without effect on the other constituents of the crops.

The composition of first-, second-, and third-crop alfalfa produced on this soil differed. The protein, sulfur, and phosphorus contents of first-crop alfalfa were lower than those of either second- or third-crop alfalfa, and second-crop alfalfa was lower in these constituents than third-crop alfalfa. Alfalfa produced on this soil responded readily to phosphorus fertilizers, which brought about increased yields and higher percentages of phosphorus in the plants. This soil was high in total phosphorus but did not meet the growing needs of the alfalfa plants. It is concluded that the nutritive value of alfalfa, with reference to protein and phosphorus content, was highest for the third crop and lowest for the first crop. Alfalfa grown on soil to which phosphorus fertilizers have been added would probably have a higher nutritive value than similar alfalfa grown on this soil without fertilizers.

The agrobiologic test for normality in fertilizer experiments and variety comparisons.—I, Varieties, O. W. WILLCOX (*Jour. Amer. Soc. Agron.*, 38 (1946), No. 3, pp. 218-224, *illus.* 1).—A variety $\times$ nitrogen fertilizer field experiment by Tolman with sugar beets (E. S. R., 89, p. 540) is cited as an example showing all

the characteristics of a perfectly normal soil for crop increase. The characteristics of normality are that the experimental yield curves of two or more varieties must show full homology with the curves of the standard yield diagram based on the Mitscherlich-Baule normal yield equation $y = A(1 - 10^{-0.301x})$, and fulfill the condition that the spread between two homologous values of y for any two values of A must increase as x increases while the ratios of the yields of the varieties remain constant. Where these conditions are fulfilled, the comparison of yielding abilities is virtually mathematically exact. In the contrary case, abnormality of soil conditions or faulty experimental technic will be indicated. The degree of departure from normality can be measured by reference to the nearest standard curve.

Soil-plant relations.—II, Balanced fertilizer use through soil tests for potassium and phosphorus. R. H. BRAY. (Ill. Expt. Sta.). (*Soil Sci.*, 60 (1945), No. 6, pp. 463-473, illus. 1).—In the second paper of this series (E. S. R., 92, p. 341), the author reports experiments leading to the following conclusions:

The quantity of a fertilizer needed to achieve balanced fertility at the maximum yield level depends on the soil supplies and the crop being grown. Supplies of the available forms of a nutrient vary from soil to soil, causing a corresponding variation in the fertilizer requirement. These soil supplies can be measured directly with soil tests. The soil test value can be substituted for b_1 in the modified Mitscherlich equation: $\text{Log } (A - y) = \text{log } A - (c_1 b_1 + cx)$. The values of all of these terms except c and x have been previously determined for different crops, and the value of x is approximately known for certain cases on the experiment fields for the rotation as a whole. This permits the calculation of c , and by using the c values obtained the approximate fertilizer requirements for each soil test value for phosphorus and potassium have been calculated. These fertilizer requirement values are used in practice in the form of a rotation requirement, which is so applied as to favor the crops with the lowest c_1 values (the crops most responsive to the nutrient added). When both phosphate and potash fertilizers are used in these quantities during the rotation they balance the soil forms and make possible a balanced fertility program as far as these two nutrients are concerned. "The old idea of a certain ratio of phosphate and potash being needed for a certain crop is not recognized in this plan except insofar as small amounts are used by placement methods for the initial stimulation of the plant."

Where the fertilizer requirement is lower than the quantity ultimately removed by crops, a gradual decrease in the available soil supplies will occur unless the rate of supply from the less available soil forms is sufficient to make up for this difference. This may be checked by a continued soil-testing program measuring the balance in the soil resulting from crop removals and possible leaching loss, on the one hand, and fertilizer additions and release from less available forms, on the other.

"These fertilizer requirements for phosphorus and potassium as determined by the soil tests are not considered recommendations except as they are recommended with a knowledge of the favorableness of the other factors in crop production."

Potassium needs of New Jersey soils. F. E. BEAR, A. L. PRINCE, and J. L. MALCOLM (*New Jersey Stat. Bul.* 721 (1945), pp. 19, several illus.).—This subject is dealt with under the captions: Plow depth acre of average soil contains 35,000 lb. potassium; from 80 to 160 lb. potassium in year's produce of average acre; potassium in interior of soil particles unavailable for current use; loam soils have high capacity to store potassium for plant use; potassium-storage capacity of sandy soils very low; soil potassium moves into plants more readily than soil calcium; plants tend to absorb more potassium than they require; percentage potassium in plants lowered by liming land; Collington soils naturally high in exchange potassium; available potassium kept at high level in well-managed land; sandy soils require frequent applications of potassium; extra potassium required for crops grown on acid soils;

potassium-deficiency symptoms often observed on New Jersey crops; and potassium an essential constituent of New Jersey fertilizers.

Although devoted mainly to the problems involved in assuring adequate potassic nutrition of crop plants, the bulletin notes also the fact that "plants tend to absorb much larger amounts of K than they need, the K content of alfalfa having been made to vary between 1.15 and 3.30 percent of the dry weight of hay without sacrificing yields. The sum of the Ca, Mg, and K in alfalfa is nearly constant, no matter what the content of the individual elements. Thus as the K content rises the contents of Ca and Mg decrease, and vice versa. Excessive absorption of K by plants is objectionable, not only because of the relatively high cost of K in comparison with that of Ca but also because the Ca need of animals and man is much greater than their need for K. Excessive absorption of K by plants can be partly overcome by liming the land liberally and by adding K fertilizers as needed rather than in very large doses at planting time. To prevent excessive absorption of K by alfalfa, the element should probably be applied as a top-dressing after the first crop of the season has been removed, rather than in late fall or early spring. Since plants tend to absorb more K than they need, cropped soils often quickly develop K deficiencies, and constant attention must be paid to replenishing their K supply."

Relation between potash in soils and that extracted by plants, E. H. STEWART and N. J. VOLK. (Ala. Expt. Sta.). (*Soil Sci.*, 61 (1946), No. 2, pp. 125-129).—Continuous cropping of 10 Alabama soils with a series of different crops quickly depleted the readily available potassium to the extent that the soils would not support plant growth even though adequate amounts of plant-food nutrients with the exception of potassium were supplied. The plants utilized nonexchangeable potassium heavily, but the amount of nonexchangeable potassium consumed bore no relation to the total potassium extracted by the crops, the total potassium in the soil, or the decrease in exchangeable potassium that resulted from cropping. An average of two-thirds of the potassium used by the plants came from forms nonexchangeable at the beginning of the test, and the amount of nonexchangeable potassium removed from the different soils varied between 39 and 87 percent of the total amount of potassium consumed by the plants. The authors found no close relationship between the potassium removed by the crops and the exchangeable potassium in the soil, removed from the soil, or remaining in the soil after cropping. Neither the exchange capacity of the soil nor the percentage potassium saturation showed a definite relationship to the quantity of potassium extracted by the plants. The variability of the capacity of different soils to release potassium from the nonexchangeable forms for plant consumption appeared to be a dominant factor in the nutrition of plants, and the magnitude of this factor was difficult to measure through the use of chemical soil tests.

Phosphate adsorption by Illinois soils, T. KURTZ, E. E. DETURK, and R. H. BRAY. (Ill. Expt. Sta.). (*Soil Sci.*, 61 (1946), No. 2, pp. 111-124, illus. 3).—Samples of the soil under examination were brought into contact with phosphate solutions of known concentration, and the phosphate remaining in solution after 10 min., after from 35 to 90 days, and after 3 yr. was determined. Adsorption curves so obtained for various soils and at various ratios were of similar shape and could be formulated in an equation of the Freundlich type. The forms in which the phosphate was adsorbed were studied by determining the ease with which the phosphate could be removed by water and other extracting solutions.

Extractions of stored samples of soils to which phosphate had been added 3 yr. before recovered over 90 percent of the added phosphate. In these extractions, three fractions were determined, namely water-soluble, adsorbed (that is, removed by 1 N NH_4F), and easily acid-soluble, were determined. These results showed that with additional time there was not only a gradual increase in the amount of phosphate adsorbed but also a gradual change in the status of the adsorbed phosphate. This

was shown by decreases in the amounts of phosphate which could be removed by water in successive extractions and by an increase in the easily acid-soluble fraction. The bulk of the added phosphate, however, was retained in the adsorbed form from which it was displaced by the fluoride ion in a neutral solution.

The phosphate-replacing abilities of several different anions were studied. An analogy between anion and cation adsorption is developed and discussed. The experiments reported indicate that the phosphate taken up by the soil is held against leaching loss but remains in a form such that it can be utilized by plants. The work also "gives evidence that so-called 'phosphate-fixation' is not a serious problem in Illinois soils, and that phosphate fixation, therefore, has no justification as an argument against the use of soluble phosphate fertilizers."

Retention of phosphates by soils, III-IV, F. L. DAVIS. (La. Expt. Sta.). (*Soil Sci.*, 60 (1945), No. 6, pp. 481-489, illus. 1; 61 (1946), No. 2, pp. 179-190, illus. 5).—This is a continuation of a series previously noted (E. S. R., 94, p. 25).

III. *Nature of phosphate retention of virgin Hammond very fine sandy loam treated with $\text{Ca}(\text{OH})_2$ and H_2PO_4* (pp. 481-489).—When small quantities of phosphorus in the form of phosphoric acid were added to suspensions of a soil in calcium hydroxide solution, the calcium and hydroxyl ions governed the extent of reversion of the phosphate; that is, the hydroxy-apatite was probably formed and the phosphate was not adsorbed by the soil as anions at pH values above 5.0 except at very low calcium concentrations. When larger quantities of phosphoric acid were added to soils under the same experimental conditions, some of the phosphorus was reverted to primary or secondary calcium phosphates which were adsorbed by the soil as anions and thereby produced an increase in the cation-exchange capacity. The smaller quantity of calcium hydroxide added, the larger was the increase in cation-exchange capacity. When large quantities of excess calcium hydroxide were present, a small portion of the added phosphorus was converted by carbonation and equilibration with air into the calcium carbonate-form of the tertiary calcium phosphate and adsorbed by the soil as such. Some of the water-insoluble phosphate retained by the soil may be held in the form of a double layer or a soil micelle-calcium-phosphate linkage.

IV. *Solubility of phosphates retained by virgin Hammond very fine sandy loam treated with $\text{Ca}(\text{OH})_2$ and H_2PO_4* (pp. 179-190).—The data given show the effects of the treatments on water-soluble phosphorus and the quantities of phosphorus removed from the soil by successive extractions with carbonic acid, 0.002 N H_2SO_4 , and 0.1 N H_2SO_4 in relation to soil reaction. The differential solubility of the phosphorus resulting from treating the soil with H_2PO_4 is compared to that obtained for similar soil samples treated with monocalcium phosphate.

The quantities of soluble phosphorus obtained by successive extractions of the soil treated with 1.08 mM H_2PO_4 per 100 gm. soil were significantly less than those obtained from the samples to which phosphorus was added in the form of monocalcium phosphate. The largest difference for the two forms was that obtained by extraction with carbonated water. At all soil reactions below pH 6.5, the amount of phosphorus soluble in CO_2 -saturated water in the H_2PO_4 -treated series was uniformly low; but at soil reactions above pH 7.0, it approached that obtained from the soil treated with monocalcium phosphate. At soil reactions below pH 6.5, the phosphorus added as H_2PO_4 became much less soluble in carbonic acid than that added in the form of monocalcium phosphate.

Manufacture of concentrated superphosphate: Effect of mixing and curing conditions on conversion, G. L. BRIDGER, R. B. BURT, and W. W. CERF (*Indus. and Engin. Chem.*, 37 (1945), No. 9, pp. 829-841, illus. 8).—Concentrated superphosphate was made in the TVA plant by mixing 78 percent phosphoric acid with finely ground rock phosphate, curing in large piles for about 12 weeks, grinding, and bagging. Data on the conversion of rock phosphate P_2O_5 to available

P_2O_5 for plant superphosphate made from Tennessee and Florida rock phosphate were obtained for a period of several years and compared with corresponding data for control superphosphates prepared in the laboratory. The conversion of the plant superphosphate was lower than that of the control. This behavior was due to differences in thoroughness of mixing, temperature of mixing, and temperature of curing. The effect on conversion of reactant temperature over the range 32° to 200° F. and of curing temperatures from 80° to 190° was determined in laboratory experiments on Tennessee rock phosphate; both low mixing temperatures and low curing temperatures favor high conversion for superphosphate made with acid stronger than 70 percent H_3PO_4 . By improving thoroughness of mixing, lowering reactant temperature, and lowering curing temperature, considerable increase in conversion can be obtained.

Liquid and solid sources of nitrogen for cotton production, 1943-45, J. PITNER and F. E. EDWARDS (*Miss. Farm Res. [Mississippi Sta.]*, 9 (1946), No. 1, pp. 1, 6).—The two commercially supplied solution fertilizers contained (1) ammonia equivalent to 24.6 percent of nitrogen and (2) both ammonium and nitrate nitrogen, the total of both forms being 40.6 percent. With cotton as the test crop, the solution containing ammonia alone produced no increase in yield in the first of the 3 yr. of the test, and increases distinctly less than those given by calcium cyanamide, ammonium sulfate, or sodium nitrate in the second and third years. The second solution, tested only in the first year, gave an increase in yield greater than that produced by the cyanamide or sodium nitrate but less than that given by ammonium sulfate.

High manure losses on Colorado farms may be reduced, experiment shows, R. GARDNER and D. W. ROBERTSON (*Colo. Farm Bul. [Colorado Sta.]*, 7 (1945), No. 6, pp. 10-12, illus. 2).—Losses of plant nutrients from manure were greatly reduced by spreading the fresh manure in the field and plowing under immediately rather than keeping the manure in storage.

Supplements to high-analysis fertilizers with special reference to sulfur, calcium, magnesium, and limestone, N. J. VOLK, J. W. TIDMORE, and D. T. MEADOWS. (*Ala. Expt. Sta.*). (*Soil Sci.*, 60 (1945), No. 6, pp. 427-435).—Experiments designed to test the need for supplementing high-analysis fertilizers with sulfur, calcium, magnesium, and minor elements showed the following results: The quantities of sulfur brought down in rain in the rural districts in Alabama are small and are probably insufficient for the normal growth of common agricultural crops. The efficiency of gypsum and elemental sulfur in increasing the yields of plant material differed but little. The sulfur concentration of the plant tissue was increased more readily through the use of elemental sulfur as a supplement than through the use of gypsum if the sulfur was given a chance to oxidize before a crop was planted. Lime increased the yield of plant material but caused a decrease in the sulfur concentration in the tissue. Sulfur, calcium, and magnesium in some form were necessary supplements to high-analysis fertilizers. Minor elements in low-grade materials also appeared to be important. Lime was necessary as a supplement for neutralizing the acidity of high-analysis fertilizers in order to obtain maximum yields of crops. Lime added in quantities equivalent to the acidity of the fertilizer applied was sufficient to maintain the pH of the soil at a constant level. The concentration of any particular cation in the exchange material after 9 yr. of fertilizer treatment was higher in soils to which the cation was added than in those to which it was not added. In general, the use of high-analysis fertilizers relatively free of the usual impurities found in low-grade materials hastened the development of nutritional problems involving calcium, magnesium, sulfur, acidity, and minor elements.

AGRICULTURAL BOTANY

Electrokinetic studies on bacterial surfaces.—I, The effects of surface-active agents of the electrophoretic mobilities of bacteria, M. T. DYAR and E. J. ORDAL

(*Jour. Bact.*, 51 (1946), No. 2, pp. 149-167, illus. 8).—The experimental work reported is exploratory in nature and represents an attempt to establish a method of characterizing bacterial surfaces. A variety of bacteria were treated with an anionic and a cationic surface-active agent, giving concentration-mobility curves which are distinctive for the various bacterial species. The changes in mobility occurring on treatment with such agents must depend on the chemical nature of the agent and that of the cell surface. The selection of sodium tetradecyl sulfate and cetyl pridium chloride for this study "was somewhat fortuitous, and it is to be expected that more distinctive concentration-mobility curves will be obtained by the use of surface-active agents of different structures or by the use of other polar molecules." The method described will prove of value in determining the chemical nature of substances present at the cell surface only if the presence of these substances is characteristically reflected in the electrokinetic behavior of bacteria in the presence of surface-active agents or other reagents. A beginning has been made in determining the electrokinetic behavior of particles of known composition in the presence of varying concentrations of surface-active agents. Striking differences have been observed in the electrophoretic behavior of substances such as hydrocarbons, protein, phospholipid, cholesterol, and inert surfaces in the presence of surface-active agents.

Further observations on the nuclear material of the bacterial cell, G. KNAYSLE (Cornell Univ.). (*Jour. Bact.*, 51 (1946), No. 2, pp. 177-180, illus. 4).—In further studies (E. S. R., 89, p. 421), microcultures of *Bacillus cereus* (strain C₃) were subjected to the Feulgen reaction at various stages of development. In very young cultures, the only Feulgen-positive differentiated structures were the cytoplasmic membrane and its extensions. At a later stage, cells grown aerobically formed lipoprotein inclusions—also Feulgen-positive. Forespores and young endospores stained homogeneously by the Feulgen technic, but mature spores exhibited a positive granule or rod. Whether this granule indicates differentiation or is due to shrinkage of the protoplasm during maturation is undetermined. The findings show that in this strain the nuclear material is diffuse both in the vegetative cell and in the young endospore, with a possible differentiation of a nucleus during maturation of the spore.

On the process of sporulation in a strain of *Bacillus cereus*, G. KNAYSLE (Cornell Univ.). (*Jour. Bact.*, 51 (1946), No. 2, pp. 187-197, illus. 18).—*B. cereus* (strain C₃) forms endospores by condensation of the protoplasm; the cytological processes involved are described. When very young sporangia are transferred—together with vegetative cells—into a fresh medium, the spores fail to germinate, and the sporangium and inclusions are preserved until the new culture reaches the sporulation stage. The form and size of the endospore and its position in the sporangium vary; its orientation seems to depend on the difference between its width and that of the sporangium; if the latter is much wider, the endospore tends to be oblique to the long axis of the sporangium. The number of endospores in a sporangium also varies. There is a tendency, however, in sporangia containing more than one spore for them to be separated—often incompletely—into monosporous sporangia. More often, a large cell forms a spore; this is followed by the formation of a partition, and another spore is usually formed in the newly delimited half of the cell. Only in a certain type of cells is sporulation preceded by enlargement of the sporangium. Sometimes midget endospores are formed.

Utilization of certain rare sugars by microorganisms, C. M. McCLOSKEY and J. R. PORTER (*Soc. Expt. Biol. and Med. Proc.*, 60 (1945), No. 2, pp. 269-271).—The authors tested 13 rare sugars, including turanose, tagatose, neolactose, primeverose, vicianose, $\beta\beta$ -trehalose, three methylated glucoses, and the Schardinger dextrans, for their utilization by 18 bacterial species and 4 yeasts. Some of these sugars

appear to be of value for differentiating certain members of the enteric group of bacteria.

A study of the effect of growth substrate on the respiration of *Azotobacter*, J. O. HARRIS. (Kans. Expt. Sta.). (*Jour. Biol. Chem.*, 162 (1946), No. 1, pp. 11-20, illus. 4).—The organic compound serving as growth substrate for *Azotobacter* markedly influences the subsequent respiratory activities of the resulting cells as measured by O_2 uptake and reduction of methylene blue in the presence of a number of common respiratory substrates. When placed under favorable conditions, the cells are capable of adapting their respiratory system to the utilization of new compounds in a relatively short time—usually less than 2 hr.

The effect of riboflavin analogues upon the utilization of riboflavin and flavin adenine dinucleotide by *Lactobacillus casei*, H. P. SARETT. (Oreg. State Col.). (*Jour. Biol. Chem.*, 162 (1946), No. 1, pp. 87-97, illus. 1).—Isoriboflavin and 1-ribitylamino-2-amino-4,5-dimethylbenzene possess little riboflavinlike activity by themselves but are able to stimulate the utilization of riboflavin and flavin adenine dinucleotide (FAD) by *L. casei*. In the presence of alloxan the riboflavinlike activity of the ribitylamino compound was markedly increased. The diaminophenazine analog of riboflavin competitively inhibited the utilization of riboflavin and FAD to the same extent. Lumiflavin can either inhibit or stimulate the use of riboflavin or FAD by *L. casei*, depending on the relative amounts of lumiflavin present. The inhibition by lumiflavin is much greater when FAD is supplied as a growth factor in place of riboflavin. The findings suggest that riboflavin may be attached to an apoenzyme before it is converted to riboflavin phosphate or to FAD. *L. casei* utilizes riboflavin, riboflavin phosphate, and FAD equally well for growth and acid production. FAD is hydrolyzed to riboflavin phosphate by weak acid and to riboflavin by enzymatic digestion.

The function of pyridoxin derivatives: A comparison of natural and synthetic codecarboxylase, W. W. UMBREIT, W. D. BELLAMY, and I. C. GUNSALUS. (Cornell Univ.). (*Arch. Biochem.*, 7 (1945), No. 1, pp. 185-199, illus. 4).—The preparation of tyrosine decarboxylase from *Streptococcus faecalis* (strain R) in a cell-free state and the resolution of this enzyme into apoenzyme and coenzyme is described. The latter is identified as a derivative of pyridoxal, and a procedure is given for the chemical conversion of pyridoxal into the coenzyme in approximately 5 percent yield. An assay system for codecarboxylase or for pyridoxal is described, the method employing tyrosine decarboxylase apoenzyme obtained from cells of *S. faecalis* grown in a medium deficient in the vitamin B_6 group.

On the function of pyridoxine in lactic acid bacteria, C. M. LYMAN, O. MOSELEY, S. WOOD, B. BUTLER, and F. HALE. (Tex. Expt. Sta.). (*Jour. Biol. Chem.*, 162 (1946), No. 1, pp. 173-174).—The results of an experiment showing the relationship of both pyridoxine and CO_2 to the amino acid requirements of *Streptococcus faecalis* R and *Lactobacillus arabinosus* are presented. From the data obtained—since CO_2 is not required for the growth of the organisms in a medium containing all the amino acids—it is deemed probable that CO_2 is required specifically for amino acid synthesis. Likewise—since neither pyridoxin nor its derivatives are required for rapid growth where all the amino acids are present, but are required in a medium where certain of them are omitted—it seems probable that some form of pyridoxine is involved in an enzyme system which carries out amino acid synthesis in these organisms.

The amino acid requirements of *Streptococcus faecalis* and the use of this organism for the determination of threonine in natural products, I. T. GREENHUT, B. S. SCHWEIGERT, and C. A. ELVEHJEM. (Wis. Expt. Sta.). (*Jour. Biol. Chem.*, 162 (1946), No. 1, pp. 69-76, illus. 1).—Leucine, threonine, glutamic acid, asparagine, lysine, valine, isoleucine, methionine, arginine, histidine, serine, tryptophan, and

cystine were required and alanine, tyrosine, phenylalanine, and glycine were found to be stimulatory to *S. faecalis*. It has been used for the assay of threonine in natural materials; suitable recovery experiments and a study of methods of hydrolysis established the validity of this assay. The following values were obtained: Animal tissue protein 4.1 to 4.7, casein 3.7, lactalbumin 5.0, soybean oil meal 3.9, and whole corn 4.4 percent threonine in the protein (calculated to 16 percent N). The values are also expressed for each sample on the basis of the percentage of threonine N of the total N.

Pléomorphism du *Penicillium notatum* et potentialité antibiotique, H. VELU, J. COMANDON, P. DE FONBRUNE, and M. M. JANOT (*Compt. Rend. Acad. Sci. [Paris]*, 222 (1946), No. 7, pp. 406-408).—The authors conclude from data presented that, as in the dermatophytes, *P. notatum* possesses a pleomorphism, reversible with difficulty, which may be accompanied by a reduction or even suppression of its bacteriostatic activity. Single spore cultures appear indispensable in obtaining strains of high antibiotic potentiality.

Studies to determine if antibiosis occurs among Rhizobia.—I, Between *Rhizobium meliloti* and *Rhizobium trifolii*, L. W. ERDMAN (*Jour. Amer. Soc. Agron.*, 38 (1946), No. 3, pp. 251-258).—In greenhouse tests with alfalfa and red clover in which single-strain cultures of the alfalfa and red clover nodule bacteria were compared with so-called combination cultures, the over-all results were significantly in favor of the latter. There was no evidence in the alfalfa tests of any inhibition of nitrogen fixation when the alfalfa bacteria were grown in the same culture with the red clover strains, thus no antibiosis or antagonism was found. In the red clover test the over-all comparisons gave no evidence one way or the other. Nitrogen fixation with four of the red clover strains gave some indication that the combination red clover plus alfalfa cultures were better than the red clover bacteria alone; there was no evidence of antibiosis with these four single-strain red clover cultures. Antibiosis was demonstrated, however, with one red clover strain and with a composite red clover plus alfalfa bacteria inoculant which included this particular red clover strain.

The nature of the antibacterial agent from *Anemone pulsatilla*, H. BAER, M. HOLDEN, and B. C. SEEGAL (*Jour. Biol. Chem.*, 162 (1946), No. 1, pp. 65-68).—The antibacterial agent of *A. pulsatilla* is shown to be protoanemonin.

Inheritance in a bread mold, L. R. WALDRON (*North Dakota Sta. Bimo. Bul.*, 8 (1946), No. 3, pp. 22, 39).—A popular account of the inheritance and nutritive requirements of a bread mold, *Neurospora*.

Some Oedogoniaceae and Zygnemataceae from Texas and Louisiana, C. E. TAFT. (Ohio State Univ.). (*Amer. Micros. Soc. Trans.*, 65 (1946), No. 1, pp. 18-26, illus. 10).—The records of these groups of fresh-water algae here presented are from 215 collections.

Notes on the grasses, sedges, and rushes of the Great Swamp (New Jersey), W. F. RAPP, JR., and J. L. C. RAPP (*Bul. Torrey Bot. Club*, 73 (1946), No. 2, pp. 203-204).—Notes on collections made by the authors in the summer of 1944.

A catalog of the vascular plants of Maryland, J. B. S. NORTON and R. G. BROWN. (Md. Expt. Sta.). (*Castanea*, 11 (1946), No. 1, pp. 1-50).—The present list includes 82 Pteridophytes and 2,334 Spermatophytes, making a total of 2,416 species, forms, and varieties known to grow without cultivation in Maryland.

Additions to the revised catalogue of Ohio vascular plants, XIII, C. H. JONES. (Ohio State Univ.). (*Ohio Jour. Sci.*, 45 (1945), No. 4, pp. 162-166).—An annotated list of further additions (E. S. R., 92, p. 181) to the State Herbarium.

Wild flowers of Mississippi, F. S. BATSON and G. W. JOHNSTON (*Mississippi Sta. Bul.* 417 (1945), pp. 60+, illus. 65).—"This bulletin has been prepared to help nature lovers and gardeners identify wild flowers of the State and to encourage

their use in landscape plantings." Although relatively few (62) of the native herbaceous plants are listed, many of the species that are more desirable for cultivation have been included and are described and illustrated.

The genus *Palafoxia* in Texas, V. L. CORY. (Tex. Expt. Sta.). (*Rhodora*, 48 (1946), No. 568, pp. 84-86).—The annual plant *P. riograndensis* n. sp. is described.

Catalogus florae Domingensis (Catalogo de la flora Dominicana).—I, **Spermatophyta**, R. M. MOSCOSO (New York: Univ. Santo Domingo, 1943, pp. 732+, illus. 5).

Las plantas medicinales de México [Medicinal plants of Mexico], M. MARTINEZ (Mexico: Ediciones Botas, 1944, 3. ed., pp. 630, about 400 illus.).—This manual—copiously illustrated and with many colored plates—considers in part 1 those plants of known botanical classification, the properties of which have been scientifically and more or less extensively studied, and in part 2 those botanically known but whose properties have been studied incompletely or not at all; lists in part 3 the plants not yet botanically identified but which are in popular use as "home remedies;" and in part 4 considers briefly and without illustrations the plants of Yucatan mentioned in the work of "El Julio" entitled "Medicina Doméstica," published in 1834.

Trees for the Aleutians, D. BRUCE and A. COURT (Geog. Rev., 35 (1945), No. 3, pp. 418-423).—Thousands of trees have been planted in the originally treeless Aleutians as a byproduct of the war. The reasons that have been advanced for the original absence of trees on the islands are two, viz, either the present climate is too severe or the trees have not yet spread so far since the last ice age. Weather statistics from a score of Army weather stations since the start of the war have indicated 130 to 190 days from frost to frost—far longer than for many heavily forested regions. For the full year 1944 precipitation ranged from 27 to 52 in.; for the 4 summer months, 7 to 15 in. It is probable that many Aleutian sites receive more sunshine than some forested regions of southeastern Alaska in the same latitude. It is not believed that, in general, the high winds or the available N, P, K, and Ca are limiting factors for tree growth. Furthermore, there is evidence to be found on Kodiak Island of the advance of the forest during the memory of older residents. Natural establishment of new foci of tree propagation removed from the present forest limit requires not only favorable conditions at the site but also recurrent means of transporting seeds or seed-bearing branches and uprooted trees. The prevailing winds are westerly, and 500 miles of ocean lie between Asia and the westernmost islands. Occasional winds blow from the northeast, but the rugged Alaska Peninsula offers few footholds for tree seedlings and ocean currents are erratic. The Army's efforts may finally answer the question whether or not the Aleutians can support the continued growth of trees.

Additional introduced plants in the Aleutian Islands, E. H. WALKER (Bul. Torrey Bot. Club, 73 (1946), No. 2, pp. 204-205).—The author records some introductions additional to those noted by Bruce and Court (see preceding entry).

Istoricheskaia geografiia rastenii: Istoriia flor zemnogo shara [Historical geography of plants: History of the world floras], E. V. VUL'F (Moskva (Moscow): Akad. Nauk S. S. S. R., 1944, pp. 545+, illus. 64).

The role of plants in geography, G. F. CARTER (Geog. Rev., 36 (1946), No. 1, pp. 121-131).—Giving consideration to the economic plants of the earth in their regional setting, the author in this address discusses the corn regions of the Americas, relationships between corn areas, application to settlement problems, the danger of plant standardization, and regions and complexes of useful plants. Historically, plant distributional studies have long been associated with geography; plant geography—and especially economic plant geography—is based on field study, with observations of soil, slope, climate, and culture supplying the necessary data for

meaningful distributional studies. As a field, plant geography is considered as valid a study as any other systematic branch of geography; in its broadest sense—and not only in its domestic plant aspects—it is vital to a comprehensive regional approach and is especially important to regional planning. The historical approach to economic plant geography gives not only greater depth to an understanding of the problems involved but aids in judging the validity of apparent environmental limitations. Finally, from an over-all view of the past and present trends in economic plant geography, the danger of suffering a tragic loss through the continuing and accelerating destruction of useful plants becomes clear.

A seven-year quantitative study of succession in grassland, J. E. WEAVER and W. E. BRUNER. (Univ. Nebr. et al.). (*Ecol. Monog.*, 15 (1945), No. 3, pp. 297–319, illus. 17).—The nature and rate of succession in a 23-year-old native pasture under complete protection from grazing were studied quantitatively near Lincoln, Nebr., during 1937–43. The pasture was of the little bluestem-Kentucky bluegrass type before the great drought of 1934–36, but was dominated by sand dropseed and side-oats grama after the high mortality of the less xeric grasses. As determined by stem counts, 14 species of grasses and sedges, 19 native forbs, and 13 ruderals constituted the total vegetation in 43 one-meter quadrats in 1937; this later increased to 58. Drought occurred each season until 1942, but growth conditions were favorable in the spring and early summer of 1938 and 1941; excellent growth occurred in 1943–44. Soil sampling revealed that the vegetation depended chiefly on current rainfall. The most marked change in quadrats dominated by sand dropseed was a steady increase in number of stems of the dominant until near the end of the drought; such conditions were followed by gradual decreases when the more mesic grasses regained their vigor—as shown by the detailed data presented. Near the end of 1940, sand dropseed still dominated in many places. After 8 yr.—and especially 3 consecutive good years—climax conditions had almost been attained, and in only a few places was sand dropseed still abundant. The bluestems and side-oats grama dominated except in parts of lowlands where bluegrass formed a dense sod; there was no bare soil. All the weedy annuals had disappeared; aster and goldenrod were also absent or greatly subdued. An understory of various minor prairie grasses, bluegrass, and forbs was rapidly developing. Under the dense stand of prairie grasses there was a good mulch of fallen debris, but the absence of certain species of prairie grasses and forbs, common in adjacent climax prairie, as well as the lack of various community relationships indicated that succession was still incomplete.

A change from grassland to forest vegetation in the "Big Barrens" of Kentucky, B. B. MCINTEER. (Univ. Ky.). (*Amer. Midland Nat.*, 35 (1946), No. 1, pp. 276–282, illus. 1).—The pioneers found vast regions of grassland in some parts of Kentucky; the early settlers gave the name "Barrens" to the region, thinking that the absence of trees signified land of low productivity. The "Big Barrens" formed a narrow crescent corresponding to that part of the State having karst lands, covering an area of 5,000 to 6,000 sq. miles. It appears that the treeless condition had been brought about by a severe drought followed by invasion of prairie-plant species, and that thereafter the grasses remained because of the combined influence of the unusual conditions in the earth's crust, extremes in some climatic factors, and the frequent fires. After settlement by the whites a young forest growth sprang up all over that part which shortly before had been covered with prairie vegetation. There are 16 references.

Investigation of plant-growth substances (auxins) in sewage products, C. A. CHAPLIN and C. J. REGAN (*Jour. Soc. Chem. Indus., Trans. and Commun.*, 64 (1945), No. 12, pp. 331–332).—In order to ascertain whether the auxin content (if any) of sewage products would be likely to play a role in their use as fertilizers, a

number of the normal sewage wastes of London were examined. The findings indicate that most of these products contain auxins in small but measurable quantities; also that—although crude and digested sludges in the wet state may both contain auxins of an order relatively high to the total solid content—most of these growth factors are decomposed during normal drying of the sludges.

Influence of sulfonamides and para-aminobenzoic acid on the growth of *Lupinus albus*. D. I. MACHT (*Soc. Expt. Biol. and Med. Proc.*, 60 (1945), No. 2, pp. 217-220).—Of the three aminobenzoic acids, the meta isomer proved the most toxic and the para isomer the least so. The latter exerted a diphasic effect on root growth; very weak solutions were growth-promoting, whereas stronger concentrations were growth-inhibitory. Sulfanilamide and six other sulfonamides exerted a similar action. Combinations of sulfanilamide and para-aminobenzoic acid in every case exerted not an antagonistic but a synergistic or potentiated depression on growth of this legume.

Tuméfaction des racines et mito-inhibition sous l'influence du camphre [Tumefaction of roots and mitoinhibition under the influence of camphor], G. DEYSSON (*Compt. Rend. Acad. Sci. [Paris]*, 221 (1945), No. 19, pp. 568-570).—In the experiments reported, camphor exercised a "mitoclasique" action on onion roots at an optimum concentration of 0.020 to 0.030 percent without provoking abnormalities in cell size. At lower concentrations—0.015 to 0.012 percent—it caused the formation of subterminal enlargements morphologically resembling those obtained with colchicine; in this case, the mitoclasique action had practically disappeared. Consequently, the two effects on the roots are considered to have been induced by different doses of the active principle, the two responses being parallel but apparently independent.

The nitrate nutrition of plants: A general survey of the occurrence and assimilation of nitrate. H. BURSTRÖM (*Lantbr. Högsk. Ann. [Uppsala]*, 13 (1945), pp. 86).—This survey considers the presence of nitrate in plants, the seat of nitrate assimilation, products of the reduction of nitrate, the enzyme chemistry of its reduction, the influence of heavy metals on its assimilation, the connection with carbohydrate assimilation, and the theories of nitrate assimilation. The bibliography covers nearly 10 pages.

Plant nutrition and the hydrogen ion.—V, Relative effectiveness of coarsely ground and finely pulverized limestone. W. A. ALBRECHT. (Mo. Expt. Sta.). (*Soil Sci.*, 61 (1946), No. 3, pp. 265-271, illus. 1).—In continuation (E. S. R., 88, p. 604), use of 10-mesh or 100-mesh pulverized limestone, CaSO_4 , and $\text{Ca}(\text{Cl})_2$ as Ca fertilizers for establishing sweetclover revealed the smaller applications of the 10-mesh limestone to be relatively most effective as measured by corn yields. In heavier rates of application (2 tons per acre), the 10-mesh limestone was more effective than the 100-mesh materials alone, or than these combined with P and K fertilizers. These findings support the view that the soil need not be a uniform medium as to degree of acidity or distribution of all the essential plant nutrients; rather, it may be a mixture representing a heterogeneous collection of foci of each of these in the mineral or rock forms weathering slowly in contact with acid clay. Plant growth may then represent the summation of root contacts with all these different fertility centers as the roots move to and get from them all that is needed for maximum productivity. According to this idea, both the very soluble and the less soluble nutrients applied in granular form would maintain this seemingly beneficial heterogeneity of fertility sources for better plant growth than would any practice aiming to blend the soil to the uniformity of nutrient solutions. This concept points to possible trouble in saturating the clay with Ca only, which would displace other essential elements. It also suggests an economy in limestone use when this fertilizer stone will serve without the extra cost of finer grinding.

On the solubility of boron compounds in the plant, E. V. BOBKO and T. D. PRIADILSHCHIKOVA (*Compt. Rend. (Dok.) Acad. Sci. U. R. S. S., n. ser., 48 (1945), No. 5, pp. 358-359*).—When plant materials (lupine and buckwheat used) were extracted with hot water by the "periodic method of extraction," the greater part of the B passed into solution; under the experimental conditions, however, one-tenth to two-tenths could not be so transferred. The principal mineral elements in the plant formed the following increasing sequence of solubility in hot water—P, Ca, B, K.

La pourriture de la betterave gelée—mécanisme de la synthèse de la fructosane [Decay in frozen beets—mechanism of fructosan synthesis], H. BELVAL and B. DELAPORTE (*Compt. Rend. Acad. Sci. [Paris], 221 (1945), No. 20, pp. 592-593*).

A field method for estimating rubber content in live roots of rubber plants, M. S. NAVASHIN and A. F. CHEREDNICHENKO (*Compt. Rend. (Dok.) Acad. Sci. U. R. S. S., n. ser., 48 (1945), No. 4, pp. 289-292, illus. 2*).—In the authors' simplified method—applicable to mass selection under field conditions—the equipment is limited to a test tube with a strip of printed text fastened to it and a glass rod. A drop of latex is taken from a surface wound made by cutting off the end of the root (e. g., of kok-saghyz); the drop is allowed to fall freely into the test tube, which has first been filled with water to a marked point. After stirring, the printed text is observed through the diluted latex—if it is readable, the root is rejected; if it is not, the root is considered deserving of propagation.

On the synthesis of rubber in plants—filling of laticiferous vessels with foreign latex, A. A. PROKOFIEV (*Compt. Rend. (Dok.) Acad. Sci. U. R. S. S., n. ser., 48 (1945), No. 7, pp. 520-523, illus. 1*).—With the idea of clearing up a number of points concerning the synthesis of rubber and the physiological role played by the laticiferous system it seemed reasonable to attempt filling the laticiferous system of one species with the latex of another. This was accomplished by grafting together plants sharply differing in the shape of their latex globules, the common dandelion, kok-saghyz, and krym-saghyz being used for the purpose. During the first year of life of the graft no mixing of the latexes was observed, but in the second year transport of the latex from the stock into the scion was noted during the latter part of the growing season. A method was also worked out whereby, through tapping the roots of one of either component of the graft, the laticiferous system of the one could be filled with the latex of the other. This transport is believed explainable through the migration of liquids in the transpiration stream by which the latex is carried along. The possibilities of the method in studies of the physiological role of latex are suggested.

The metabolism of starving leaves.—VI, Nitrogen balance sheet and changes in organic acid content during starvation of oat leaves, D. H. CRUICKSHANK and J. G. WOOD (*Austral. Jour. Expt. Biol. and Med. Sci., 23 (1945), No. 3, pp. 243-247*).—In this paper (E. S. R., 92, p. 187), a balance sheet of changes in the amounts of nitrogenous substances in oats leaves during starvation is presented for two experiments. Determinations of protein, peptides, residual amino acids, glutamine, asparagine, arginine, ammonia, nitrate, purines, betaine and choline, and basic nitrogen were made—all expressed in terms of their N contents; up to onset of browning of the leaves, the amounts of these substances accounted for 95 to 100 percent of the total N. No change in the amounts of nitrate N, betaine and choline N, and purine N could be detected during the starvation period, the major changes involving redistribution of the N of protein, peptides, amino acids, amides, and ammonia. With onset of browning, a loss of total N occurred and the substances estimated accounted for only 75 to 80 percent of the total N in the leaves. Malic and citric acids increased during starvation; the evidence suggested that part of these acids was derived from

nitrogenous sources (probably amides) but that no simple relationship exists between the amides and acids.

On the correlation between the reaction of flowering to the nitrogenous food and the photoperiodic reaction of the plant, M. C. CAJLACHJAN (*Compt. Rend. (Dok.) Acad. Sci. U. R. S. S., n. ser., 48 (1945), No. 5, pp. 360-364, illus. 4*).—According to studies by the author and other workers, plants may, in general, be placed in three groups according to their flowering reactions to nitrogenous nutrition: (1) N-negative plants which bloom earlier with complete elimination or low dosages of N, (2) N-positive plants which bloom earlier with normal or increased dosages of N, and (3) N-neutral plants which bloom at the same time irrespective of the N dosage or on a variety of soils. There also exists a correlation between the photoperiodic and flowering reactions to mineral nutrition. It became evident, however, that, although the N and photoperiodic groups for the most part coincide, there are certain deviations from this regularity. In the experiments here reported, all the N-negative plants were in the long-day group. The N-positive plants of low N threshold formed an intermediate or transitional group containing both long- and short-day plants. All the N-positive plants of high N-threshold were short-day plants. Finally, the N-neutral group included both short- and long-day species. Two other relationships of the blooming reaction v. N nutrition depended on the length of the growing period of a variety and on the earliness or lateness of varieties within the same species. The greater the length of the growing period—as controlled by the light regime—the greater were the differences in development rate as correlated with the N nutrition. Certain suggestions are made with respect to the evolution of these reactions.

Effect of day-length upon salt-resistance in cotton, V. A. NOVIKOV (*Compt. Rend. (Dok.) Acad. Sci. U. R. S. S., n. ser., 48 (1945), No. 6, pp. 444-446*).—The author's studies led to the conclusions that when cotton is cultivated under short day its salt resistance is reduced; its susceptibility to short day heightens with increases in salinity; its increased reactivity to the short day under saline conditions is correlated with exhaustion; and the reduced salt resistance with short day depends on the reduced accumulation of organic substances within the plant. It is suggested that the salt resistance of the plant will increase along with its photosynthetic activity.

GENETICS

Five years of colchicine research, J. M. KRYTHE and S. J. WELLENSEK (*Bibliog. Genet., 14 (1942), No. 1, pp. 132*).—The literature (385 references) on induction of polyploidy in higher plants by the action of colchicine is discussed in detail, and the other effects of colchicine on both plants and animals are reviewed. The species treated with colchicine—243 species in 137 genera—are tabulated, and the amphidiploids produced—40 species crosses on 11 genera and 3 genus crosses—are listed. Some 47 substances with more or less similar action are also tabulated; thus far permanent polyploidy is said to have been induced only with growth substances and acenaphthene.

Self- and cross-fertility relationships in *Lotus corniculatus* L. and *Lotus tenuis* Wald. et Kit., G. A. TOME and I. J. JOHNSON. (Iowa Expt. Sta.). (*Jour. Amer. Soc. Agron., 37 (1945), No. 12, pp. 1011-1023, illus. 2*).—Both the broad-leaf (*L. corniculatus*) and narrow-leaf (*L. tenuis*) types of birdsfoot trefoil had a high degree of self-sterility as measured by percentage of pod set and number of seeds per pod in a greenhouse study. Chromosome numbers of $n = 6$ for *L. tenuis* and $n = 12$ for *L. corniculatus* were verified. Crosses between the two species gave no seed set, yet a high percentage of pod set was obtained with *L. tenuis* as the female parent, and very low pod set with *L. corniculatus* as the female parent. Differences

in pod set with reciprocal crosses were explained on the basis of chromosome balance between the stylar tissue and the pollen tube. Crosses between an autotetraploid ($4n$) *L. tenuis* were produced by colchicine treatment, and *L. corniculatus* failed to produce viable seeds although pod development was normal.

"Long husk" sterility in maize, W. R. SINGLETON. (Conn. [New Haven] Expt. Sta.). (*Jour. Hered.*, 37 (1946), No. 1, pp. 29-30, illus. 1).—A brief comment is made upon an inbred line of sweet corn, Connecticut 95, that is incapable of maintaining itself under open-pollination field conditions because of the extremely long husks. These may prevent the silks emerging in time to be pollinated, or the silks themselves may be incapable of enduring long enough to become pollinated.

Tetraploidy in flax, J. G. ROSS and J. W. BOYES (*Canad. Jour. Res.*, 24 (1946), No. 1, Sect. C, pp. 4-6, illus. 1).—Tetraploid forms of Redwing flax and the F_1 of Bison $\times$ Redwing were obtained most easily by treatment of the epicotyl of seedlings with colchicine in lanolin emulsion. Their seeds were considerably larger than those of the diploid; but, because of their lower fertility and later maturity, yield and quality were definitely inferior.

Potato breeding methods.—III, A suggested procedure for potato breeding, F. A. KRANTZ (*Minnesota Sta. Tech. Bul.* 173 (1945), pp. 24).—Recent information on potato breeding (*E. S. R.*, 61, p. 722), particularly since the formation of the National Potato Breeding Program in 1929, is summarized with discussion of the indicated procedures for potato improvement. Literature cited includes 52 titles.

Characteristics of the potato that seem to influence the method of breeding include asexual propagation, ease of selfing and crossing, influence of sexual reproduction on tuber yield, partial elimination of pollen sterility through the pollen, relation of stainable pollen in female parents to proportion of sterile to fertile pollen plants in sexual progenies, and effects of selfing and crossing. Breeding procedures are suggested for development of better pollen parents, utilization of these fertile pollen plants in crosses to obtain sterile and fertile pollen plants with the desired characters, and further crosses between selected sterile and fertile pollen plants of enough genetic diversity in origin to give an opportunity to obtain sterile pollen and shy blooming selections of high-yielding ability with an improved combination of characters.

Further studies on southern stem blight resistance in tomato lines and varieties, J. L. BOWERS and J. T. PRESLEY (*Miss. Farm Res. [Mississippi Sta.]*, 9 (1946), No. 1, pp. 1, 8).—Of 42 lines and selections of tomatoes tested in the spring of 1945 for resistance to stem blight, two species (*Lycopersicon pimpinellifolium* and *L. hirsutum*) showed some degree of resistance. The VBL 42-23 line obtained from a cross of *L. pimpinellifolium* and *L. esculentum* showed the highest degree of tolerance based on survivors of two inoculations. Good records were made also by certain other VBL (U. S. D. A. Regional Vegetable Breeding Laboratory) lines. Tests conducted in the fall of 1945 with plants about 4 weeks of age and with plants ready for transplanting into the field showed the older plants to possess a much higher degree of resistance. The highest survival in the young group was 43.7 percent and in the older group 87.5 percent. The results of all the trials suggested marked progress in the development of tomatoes possessing resistance to southern stem blight.

The behavior of the self-compatibility factor and its relation to breeding methods in *Trifolium repens*, S. S. ATWOOD. (U. S. D. A. et al.). (*Jour. Amer. Soc. Agron.*, 37 (1945), No. 12, pp. 991-1004).—Results of investigations on the behavior of the S_1 gene in white clover are summarized. In a heterozygous S_1S_2 plant, the two types of gametes were produced in about equal numbers at least following macrosporogenesis, but when pollen from such a plant was placed on a stigma bearing two other alleles, S_1 pollen functioned to produce less than one quarter of the resultant progeny. When a heterozygous S_1S_2 plant was crossed as male onto a

self-incompatible plant bearing S_a , S_a pollen was inhibited completely, despite association with S_f . In a heterozygous $S_f S_a$ plant used as female, the S_f functioned as a partly dominant factor when all pollen normally would have been inhibited ($S_a S_a$) permitting some seed set, but the oppositional effect was not disturbed by S_f when only part of the pollen was inhibited ($S_a S_a$). Homozygous $S_f S_f$ individuals were obtained in expected frequencies following selfing or intercrossing of heterozygous S_f plants, and they were detected easily by a progeny test. Such homozygous plants might prove useful in breeding operations, since the few tested so far have imparted considerable vigor and good seed setting ability to their F_1 progenies.

A mottled-leaf character in winter squash—inherited as a dominant mendelian character, D. H. SCOTT and M. E. RINER. (U. S. D. A.). (*Jour. Hered.*, 37 (1946), No. 1, pp. 27-28, illus. 1).—Mottled leaf, a distinctive vegetative character in the winter squash (*Cucurbita maxima*), was found to be inherited as a single dominant gene that may have value as a marker for use in linkage studies.

Maternal inheritance of variegation in common wheat, W. K. PAO and H. W. LI (*Jour. Amer. Soc. Agron.*, 38 (1946), No. 1, pp. 90-94).—A yellow-striped plant, found in a common wheat (Mo 101) variety, proved to be a case of maternal inheritance. Variegated plants always segregated into normal green, variegated, and pure yellow in different proportions in the subsequent generation. Pure-breeding, truly variegated lines were never isolated.

Fertilization in Ulmus with special reference to hybridization procedure, L. P. V. JOHNSON (*Canad. Jour. Res.*, 24 (1946), No. 1, Sect. C, pp. 1-3).—Germination tests on fruits derived from open-, self-, and crosspollinations made in *Ulmus* during four seasons strongly indicate a high degree of self sterility, possibly due to protogyny. It is suggested that a hybridization procedure involving the crosspollination of nonemasculated flowers is feasible in many species of the genus, especially under conditions that permit large-scale crossing and the growing of fairly extensive populations from which selfed seedlings may be eliminated.

Genetic purity in animal colonies, F. B. HUTT. (Cornell Univ.). (*Ann. N. Y. Acad. Sci.*, 46 (1945), Art. 1, pp. 5-21, illus. 1).—Differences in form, physiology, and viability among litter mates are noted. Important differences may occur between breeds as a result of multiple factor differences which may be cumulative. The effects of inbreeding in reducing heterozygosity and increasing uniformity are noted.

Evidence of genes for female sterility in dairy cows, P. W. GREGORY, W. M. REGAN, and S. W. MEAD. (Univ. Calif.). (*Genetics*, 30 (1945), No. 6, pp. 506-517, illus. 1).—A qualitative analysis of female fertility and sterility was made for all Jerseys and Holsteins of the California Experiment Station herd that have reached the age of reproduction during the past 25 yr. The Jerseys numbered 266 cows sired by 16 bulls; the Holsteins, 94 cows sired by 2 bulls. Only a few of the bulls produced sufficient progeny for an adequate genetic analysis, but the use of sire-daughter matings permitted a Mendelian analysis for genes conditioning female sterility.

The female sterility transmitted by each of the bulls tested followed a single autosomal recessive factor with a sex-limited pattern of inheritance. It was not determined whether the original bulls carried the same or different genes for female sterility. Judging from the evidence, the original population of Jersey and Holstein cows carried a gene for female sterility, the frequency value being approximately 0.1 or less. "All the sterile females observed could be accounted for by a specific gene for sterility. Judging from this and other studies, heredity plays a more important role in female sterility than is generally suspected."

Artificial insemination of Australian Merino sheep (Sydney: Australasian Med. Pub. Co., 1942, pp. 52, illus. 8).—Directions for the collection of semen from rams and its use for artificial insemination are described. In addition to a foreword by

G. B. S. Falkiner (pp. 5-7), there are included: Some Genetical Aspects of Artificial Insemination, by R. B. Kelley (pp. 9-14); Field Methods—A, Artificial Insemination of Sheep (pp. 15-32) and B, Preliminary Trials at Haddon Rig (pp. 33-50), by W. Granger; and The Likely Utilization of Artificial Insemination in Sheep Breeding in Australia, by R. M. C. Gunn (pp. 51-52).

The genetics, physiology, and economic importance of the multinipple trait in sheep, R. W. PHILLIPS, R. G. SCHOTT, and D. A. SPENCER (*U. S. Dept. Agr., Tech. Bul. 909 (1945), pp. 16, illus. 8*).—A more comprehensive account of the information previously noted (E. S. R., 95, p. 42).

Prenatal development of the sheep, W. W. GREEN and L. M. WINTERS (*Minnesota Sta. Tech. Bul. 169 (1945), pp. 36, illus. 57*).—The rate of fetal development of prenatal sheep is described and illustrated much as was done for the prenatal bovine (E. S. R., 88, p. 181), using fetuses of known age. Comparison was made with the different stages of bovine development.

Relative growth in races of mice produced by selection, J. W. MACARTHUR and L. P. CHIASSON (*Growth, 9 (1945), No. 4, pp. 303-315, illus. 2*).—"Selections for body weight in the house mouse produced small and large races which differ significantly in linear measurements, in relative length of the appendages (tail, ear, hind foot), and in litter size. For each appendage there proved to be two phases of relative growth, the first of tachy-heterauxesis—the second of brady-heterauxesis. The breaks between phases occur when the body is 40 to 70 mm. long, but are not synchronous for the three appendages. The difference in relative length of appendages between races, sexes, and ages are shown to depend primarily upon body size and the genetic factors controlling it. Length of each appendage is controlled by general body size factors, acting with or on characteristic specific rate determinants for heterauxesis. These determinants were not changed by the body size selections. The mice all form one allometric tribe, not differing in *b* or *k* constants."

Evidence for normal segregation of species-specific antigens in the backcross of species hybrids in doves, M. R. IRWIN and L. J. COLE. (Univ. Wis.). (*Genetics, 30 (1945), No. 6, pp. 487-495*).—When several hybrids from a cross of Senegal and ringdove were mated to ringdove, "the antigens specific to Senegal, as contrasted to ringdove, appeared to segregate at random in the first backcross generation; at least the segregation was not sufficiently at variance with expectation according to chance alone to be detected. Because the distribution of these cellular characters of Senegal appeared to be normal, it may be concluded that there was more or less normal assortment in the species hybrid parents of the nine or more chromosomes of Senegal carrying genes for antigens specific to the species. This in turn suggests that there was more or less normal pairing of these nine chromosomes of Senegal with partners in ringdove."

The effects of low incubation temperatures on the expression of rose and duplex comb, crest, muffs, frizzled, naked neck, and triple spurs in the domestic fowl, P. D. STURKIE. (Ala. Polytech. Inst.). (*Amer. Nat., 79 (1945), No. 782, pp. 286-288*).—In continuing the study of the effect of low temperatures on development of embryos (E. S. R., 90, p. 468), incubation for 2, 3, and 5 days was found to be effective on several characters, particularly crest, duplex comb, and muffs, which were shown by a Houdan ♂ homozygous for these characters mated with normal White Leghorn ♀♀. All the embryos produced from these matings and a homozygous frizzle ♂ mated with nonfrizzle ♀♀ showed the dominant characters except in the frizzled matings, where a few normal or questionable offspring were obtained.

Biological actions of sex hormones, H. BURROWS (*Cambridge, Eng.: Univ. Press, 1945, pp. 514+*).—This comprehensive manual is divided into six parts, dealing, respectively, with gonadotropins (pp. 1-95), gonadal hormones (pp. 96-151), androgens (pp. 152-250), estrogens (pp. 251-388), progestins (pp. 389-439), and sex hormones of the adrenal cortex (pp. 440-456).

Induction of estrus in the ovariectomized golden hamster, A. H. FRANK and R. M. FRAPS. (U. S. D. A.). (*Endocrinology*, 37 (1945), No. 5, pp. 357-361).—Estrus was regularly induced in the ovariectomized golden hamster by injection of 10 γ of estrogen followed by injection in 24 to 48 hr. with injection of 0.05 to 0.5 mg. of progesterone. A single dose of estrogen alone over a wide range of dosages induced estrus in only a small percentage of the animals. Estrus response following estrogen-progesterone was of longer duration and resembled estrus in the normal ♀. Study was made with 93 ovariectomized hamsters.

Response of chicks to pituitary gonadotropins and pregnant mare serum, W. R. BRENNEMAN (*Ind. Acad. Sci. Proc.*, 54 (1944), pp. 207-213).—Chicks kept without food or water during a test period of 12 to 96 hr. after hatching proved to be very responsive to pregnant mare serum and pituitary gonadotropins, both of which caused increased gonad weight. Three divided doses were more effective than a single dose. Only the combs of chicks composing 15- and 20-day series were increased in weight following the administration of pregnant mare serum, and higher doses were required in experiments of shorter duration. The 96-hr. test was about 30 to 40 times more sensitive than the longer assay. Follicular stimulating hormones were effective on chicks but showed no augmentation when combined with lutein hormone. Small doses of 0.2 rat units of follicle-stimulating hormone and 0.5 rat units of luteinizing hormone daily were ineffective in 15-day chick experiments. Good response only occurred at the relatively high dosages of 10 to 20 rat units. Both follicle-stimulating and luteinizing hormones increased comb growth in young and mature birds.

Effects of FSH and LH upon the ovaries of immature chicks and low-producing hens, A. V. NALBANDOV and L. E. CARD. (Univ. Ill.). (*Endocrinology*, 38 (1946), No. 2, pp. 71-78).—In these tests of gonadotropic hormones, female chicks were injected with one "hen unit" of FSH followed by LH at 30, 60, 90, 120, 150, and 180 days of age. Some increase in ovarian and oviductal weights resulted. No follicles of ovulatory size were produced before 180 days of age. It was found possible to produce follicles of ovulatory size and cause them to ovulate 8-22 days before their uninjected controls would commence to lay normally. In nonlaying hens FSH and LH caused the production and the ovulation of an average of 4.2 ova per hen following injection of LH. One hen of 7 began to lay and laid 5 eggs in 13 days. In low-producing hens FSH and LH treatment caused 6 of 7 hens to commence laying. In this group only 1 ovulation per hen was produced following the LH injection.

Interruption of ovulation in the hen by subcutaneously administered non-specific substances, R. M. FRAPS and B. H. NEHER. (U. S. D. A.). (*Endocrinology*, 37 (1945), No. 6, pp. 407-414).—Experiments are reported in which hens in fair regular production were injected subcutaneously, in saline, with various nonspecific (hormone-free) substances which inhibited or interrupted ovulation. "Effective preparations include desiccated tissues (corpus luteum and ovarian residues of the cow; brain, muscle, and oviduct of the chicken), whole dried egg white, proteins (ovalbumin and casein) and peptone. At relatively high doses all of these substances bring about prompt and extensive follicular atresia, with cessation of ovulation. Control injections of saline and distilled water were of little or no effect. The effectiveness of ovalbumin, casein, and peptone indicates that the action of the dried tissue preparations and egg white may be attributed to their content of proteins or protein derivatives. Following the administration of some preparations at relatively low doses, ovulation was inhibited for at least 6 to 11 hr. beyond the time of its normal occurrence without evidence of the onset of atresia, suggesting that the nonspecific substances may act through the anterior pituitary gland or its gonadotrophins."

The relation between ovulation frequency and the incidence of follicular atresia following surgical operations in the domestic hen, I. ROTHCHILD and R. M. FRAPS. (U. S. D. A.). (*Endocrinology*, 37 (1945), No. 6, pp. 415-430, illus. 2).—The incidence of follicular atresia was studied in six groups of domestic hens subjected to one each of the following operations: Removal of the most recently ruptured follicle (111 birds), removal of the next older follicle (51 birds), removal of a follicle older than either of the first two (39 birds), sham ovarian operation (35 birds), operation on the right side of the body cavity (sham) (15 birds), and operation on the breast muscle (37 birds). It was found that in all the groups which were subjected to abdominal operations the incidence of atresia was inversely proportional to the frequency of ovulation preceding operation. The induction of atresia was found to be associated with the effects of abdominal operation per se, rather than with the removal of an ovarian element. Operations performed on the breast muscle, however, resulted in a negligible incidence of atresia. It was also found that, in birds of the same or similar ovulation frequencies, the incidence of atresia was directly related to the loss in body weight following operation. However, proportionately much greater increases in the incidence of atresia occurred in birds of similar body weight changes in relation to decreases in ovulation frequency than they did in birds of similar ovulation frequency in relation to increases in weight losses. A theoretical explanation of the relationship is offered which is based on the assumption that the induction of atresia is mediated through the pituitary gland.

Capon production by the use of synthetic oestrogen (stilboestrol), D. J. G. BLACK and R. G. BOOTH (*Vet. Jour.*, 102 (1946), No. 2, pp. 41-44, illus. 2).—Changes simulating caponizing were produced in 17-week-old cockerels by feeding 1 to 1.5 mg. of stilbestrol per day. The utilization of feed was improved by estrogen feeding to birds. However, optimal results were not obtained.

Immunogenetic studies of cellular antigens: Individual differences between species hybrids, M. R. IRWIN and L. J. COLE. (Univ. Wis.). (*Genetics*, 30 (1945), No. 5, pp. 439-447).—"Individual differences in antigenic content were observed among the cells of species hybrids of the cross of Senegal X ringdove. It was found that some of these differences could be explained by the segregation of at least a part of three separate antigenic characters (*d*-1, *d*-2, and *d*-4) peculiar to Pearlneck—as compared with ringdove—which are also shared by Pearlneck, in whole or in part, with Senegal. Differences in reactivity of reagents prepared from Pearlneck and Senegal antisera, respectively, showed that a part of the *d*-2 substance of Pearlneck is shared by Pearlneck and Senegal, but a part is particular to Pearlneck."

FIELD CROPS

Forty-seven years of experimental work with grasses and legumes in Alaska, D. L. IRWIN (*Alaska Sta. Bul.* 12 (1945), pp. 48, illus. 1).—Experimental data on grasses and legumes tested for pasture and hay at the several stations in Alaska since 1902 are summarized with notes on native grasses, descriptions of important cultivated grasses and legumes, hay and pasture mixtures, seedbed preparation and seeding, and harvesting the crop.

Native grasses found widely disseminated over Alaska, even far north of the Arctic Circle, make quick growth, mature early, and soon thereafter become tough and unpalatable. Their optimum harvesting stage for either hay or silage is when the head is just emerging from the boot or sheath. Cutting or pasturing native grasses, year after year, has quickly depleted the stand. Best results have been obtained by cutting or pasturing the same areas at 2- or 3-yr. intervals. Overgrazing the native grasses quickly kills the entire stand, and wind and water erosion is certain to result. None of the native legumes tried has been found satisfactory under cultivated conditions,

Tap-rooted alfalfas and clovers seeded alone usually winter-kill during the first winter. Occasionally they persist for several years, but vigor and stand is usually impaired. Legumes live over longer periods and produce heavier crops of hay or pasture when seeded on established grass meadows. Siberian alfalfa (*Medicago falcata*), perennial vetch, and white clover are the only legumes found consistently hardy over the entire area of Alaska. Annual vetches and Canadian field peas have made excellent hay or silage crops alone or when seeded in mixtures with oats or other small grains, and cut when the oats are at the soft-dough stage. This is the standard hay and silage crop in most of the farming districts.

Plants found best adapted to the south Alaska coast area are tall oatgrass, meadow fescue, meadow foxtail, smooth brome grass, slender wheatgrass, timothy, reedtop, creeping bent, and Kentucky bluegrass; and the perennial legumes Siberian alfalfa, alsike clover, perennial vetch, and white clover.

Cultivated grasses adapted to central Alaska, including upper Cook Inlet and as far north as the Alaska Mountain Range, are smooth brome grass, Russian wild-rye, meadow fescue, meadow foxtail, slender wheatgrass, and sheep, Chewings, and creeping red fescues, Kentucky and Canada bluegrasses, and timothy. Legumes best adapted to this region are alsike clover, Siberian alfalfa, Russian red clover, perennial vetch, and white clover.

In the northern area, including the Tanana River Valley and as far north as the Yukon River, best-adapted grasses are smooth brome grass, slender wheatgrass, western wheatgrass, tall meadow oatgrass, Kentucky bluegrass, and meadow, creeping, red, Chewings, and sheep fescues, and timothy. Legumes found best for the northern area are Siberian alfalfa, Russian and Siberian red clovers, alsike clover, white clover, and perennial vetch.

Broadcasting N fertilizer at 200 to 400 lb. of ammonium sulfate per acre or spreading manure at 6 to 8 tons per acre on grass meadows in spring at the beginning of the growing season has more than doubled the yield of hay or pasture. Applications of 100 lb. of nitrate fertilizer broadcast on the soil surface when legumes or grasses are seeded induces quick growth and secures a better stand. Larger yields of grass for hay or pasture are obtained if the land is cultivated with a spring-tooth harrow, or lightly disked every 2 yr.

Successional trends on a conservatively grazed desert grassland range, H. S. HASKELL. (Univ. Ariz.). (*Jour. Amer. Soc. Agron.*, 37 (1945), No. 12, pp. 978-990, illus. 3).—Successional changes resulting from conservative grazing on a formerly deteriorated desert grassland range near Oracle, Ariz., were compared with those on adjacent heavily grazed range by the line interception method. On the conserved area, under intensive land management since 1923, a partial reestablishment of climax grass species, as black grama and hairy grama, had resulted, accompanied by a reduction in the unpalatable desert shrubs burroweed and snakeweed. Rothrock grama and red-three awn were the dominant grasses in the current sub-climax, and these grasses with other herbaceous species comprised a total herbaceous density of 1.80 percent. Burroweed and mesquite formed a major portion of the total shrub density of 3.80 percent. Continuous heavy use on the overgrazed range had resulted in the establishment of a desert shrub community, with a total shrub density of 8.52 percent. Total density of herbaceous vegetation was 0.16 percent, in which the principal species were short-lived perennial grasses and weeds, with climax grasses occurring as widely scattered remnants.

The effect of plowing under and the time of plowing under legumes on the conservation of nitrogen, J. W. TIDMORE and N. J. VOLK. (Ala. Expt. Sta.). (*Jour. Amer. Soc. Agron.*, 37 (1945), No. 12, pp. 1005-1010).—Plowing soybeans under in the spring was superior to plowing them under in the fall, because yields of succeeding crops in rotation were greater and less N was lost by leaching during

winter. Plowing under soybeans or vetch for 9 yr. resulted in an increase of 60 percent in the organic matter content of the soil and an increase of 30 percent in its total N.

Lime and phosphate were not enough (*Dairy Res. Digest [Louisiana Sta.]*, 4 (1946), No. 1, p. 1).—In tests from areas near Bogalusa, La., barnyard manure and potash, or both, with lime and phosphorus, caused marked increases in pasture growth and nutritive value as compared to pasture herbage treated with only lime and phosphate.

Pasture fertilization experiments at Reymann Memorial Farm, F. W. SCHALLER, G. G. POHLMAN, H. O. HENDERSON, and R. A. ACKERMAN (*West Virginia Sta. Bul.* 324 (1945), pp. 24, illus. 5).—Pastures on Monongahela silt loam, seeded to Kentucky bluegrass, redbud, and white clover, and grazed 1931–41 with Ayrshire cows and heifers, were untreated or treated with lime and superphosphate; lime, superphosphate, and potassium chloride; and lime, superphosphate, potassium, and sodium nitrate. A marked increase in yield occurred on all treated pastures. Indications were that lime and superphosphate and potassium, lime, and superphosphate gave profitable yield increases. Nitrogen increased yields, but not more than enough to pay for cost of application. Liming and fertilizing increased the amount of clover and bluegrass in all pastures. Analyses of the herbage revealed marked increases in mineral and protein content as a result of liming and fertilization. Soil analyses showed a considerable residual effect in 1942 of lime and superphosphate applied in 1931 and 1933. Treated pastures also had a higher content of organic matter in 1941. There was good agreement between increases in yields as measured by days of grazing obtained, gain in weight, and yield of total digestible nutrients. See earlier notes (E. S. R., 78, p. 331).

Improving pastures and grasslands for the Northeastern States at the United States Regional Pasture Research Laboratory (U. S. Dept. Agr., Misc. Pub. 590 (1946), pp. 29+, illus. 13).—Activities of this laboratory described include its research program on pasture problems, especially establishment, fertilization, and management of pastures, chemical problems in pasture research, breeding of new varieties of grasses and legumes, and plant-disease problems of grasslands. Its publications on various phases of the work are listed, and mention is made of the laboratory staff, buildings, and equipment at State College, Pa.

The effect of early spring flooding on certain forage crops, J. L. BOLTON and R. E. MCKENZIE (*Sci. Agr.*, 26 (1946), No. 3, pp. 99–105, illus. 4).—Sweetclover, alfalfa, and crested wheatgrass could withstand only short periods of flooding in experiments at the Val Marie and Eastend Irrigation Projects near Swift Current, Sask., while brome, slender wheatgrass, and meadow fescue were able to stand fairly long periods. Timothy and reed canary grass endured the most flooding of the crops tested.

Measured crop performance 1945: Corn hybrids, cotton, wheat, oats, barley, rye, R. P. MOORE and G. K. MIDDLETON (*North Carolina Sta. Bul.* 354 (1946), pp. 54, illus. 4).—Field crop varieties outstanding in official tests in different localities of North Carolina in 1945 and over several years and variously recommended in 1946 for nine zones within the Mountain, Piedmont, and Coastal Plain sections (listed alphabetically) include the corn hybrids DeKalb 923, G94, G135, G714, and G717, 977M and 987M, N. C. T1, T11, T20, T23, and N. C. 1028, 1032, and 1111, S210, Tenn. 10 and 15, and U. S. 13 and 282; Coker 100 Wilt, 100, and 200 cotton; Davidson, Hooded 26, Randolph, Sunrise, and Tenn. 6 barley; Fulgrain, Fulwin, Lee, Lemont, Letoria, Stanton, and Victorgrain oats; and Carala, Fulcaster, Hardired, Mattany, Redhart, and Thorne wheat. Yields and other agronomic characters of these and other varieties are again (E. S. R., 92, p. 784) set forth in tables reporting results of individual tests and averages.

Alfalfa in Missouri, W. C. ETHERIDGE and C. A. HILL (Missouri Sta. Bul. 492 (1945), pp. 16, illus. 8).—Correct practices in growing alfalfa in Missouri discussed include selection of land—a fertile, deep, and well-drained soil, limed and fertilized if needed; good seed of an adapted variety, preferably of a common strain grown westward and northward of Missouri; thorough seedbed preparation; planting inoculated seed about August 15; cutting when new growth is 2 to 3 in. long; and cultivation of established stands, i. e., with a spring-tooth harrow fitted with half-round teeth. Comment is also made on merits of alfalfa-grass mixtures, relation of alfalfa to soil erosion, and diseases of alfalfa.

The carotene content of alfalfa strains and hybrids with different degrees of resistance to leafhopper injury, W. E. HAM and H. M. TYSDAL. (Nebr. Expt. Sta. coop. U. S. D. A.). (*Jour. Amer. Soc. Agron.*, 38 (1946), No. 1, pp. 68-74).—New growth of field-grown alfalfa was higher in carotene than more mature growth. Strains showing least yellowing after leafhopper attack were higher in carotene content than those which yellowed badly. In general strains or hybrids having a high leaf percentage contained more carotene content than those with a lower leaf percentage. On the average, 77 percent of the carotene content of the plant was found in the leaves. Strains and hybrids differed inherently in carotene content.

Chufas in Florida, G. B. KILLINGER and W. E. STOKES (*Florida Sta. Bul.* 419 (1946), pp. 16, illus. 5).—The uses of chufas (*Cyperus esculentus*) for human food and hog feed, production practices, insects, pests, and diseases, and their place in Florida agriculture are discussed together with a report on spacing and fertilizing experiments 1934-35, 1943-44. Greatest increase in chufa yields can be expected from proper spacing of plants. On a Norfolk soil largest yields may be made by plants 12 in. apart in 2-ft. rows, or 6 in. apart in 3-ft. rows. Response of chufas to applications of fertilizers has been somewhat erratic. The hay (chufa tops) is low in protein but has an average quantity of other minerals, which apparently may be increased by fertilization. Chufas contain slightly more than half as much oil as peanuts and are relatively low in protein for a nut crop and low in Ca and Mg. Negro bugs may do considerable damage, resulting in lower yields if the chufas are not hogged off or harvested at maturity in the fall.

Manure increased clover yield by eighty percent (*Dairy Res. Digest* [Louisiana Sta.], 4 (1946), No. 1, p. 1).—Highest average yields and percentages of protein and minerals were obtained on white-clover pasture at DeRidder, La., treated with phosphate and potassium chloride in combination with manure. Among unmanured plots, best results were secured when lime, phosphate, and potash were used. Thorough seedbed preparation, including plowing, disking, harrowing, and packing, proved better than the use of the disk in breaking the sod.

Carotene content of the corn plant, J. W. PORTER, F. M. STRONG, R. A. BRINK, and N. P. NEAL. (Wis. Expt. Sta.). (*Jour. Agr. Res.* [U. S.], 72 (1946), No. 5, pp. 169-187, illus. 6).—Concentration of carotene in the leaf blades of corn plants was 20 to 50 times higher than in the remainder of the plant. Stalks, ears, and husks all have about the same concentration, at least in the early dent stage of growth. The concentration of carotene in leaves reached a peak at the pollen-shedding stage and then declined rapidly. Prevention of pollination by bagging the ear shoot did not prevent this drop. The total carotene content of the plant, however, remained relatively constant until near the end of the growing season, when it also fell sharply.

The optimum period for harvesting with respect to total yield of both carotene and silage was for most strains at the medium dent stage of maturity. Significant differences in carotene content between stocks, both inbred and hybrid, were found to exist, but were small relative to those associated with stage of plant development and with seasonal factors. Sweet corns, it was suggested, may retain a relatively

high carotene content as the season advances. The sun-red gene did not influence the carotene content of corn plants.

Effect of certain summer and winter legume crops in improving corn yields in south Louisiana. H. B. BROWN (*Louisiana Sta. Bul.* 396 (1945), pp. 36, illus. 6).—Soybeans planted in the row with corn made good growth, averaged 3,108 lb. of dry soybean hay per acre, and increased the soil organic matter 0.176 percent and total N 0.0088 percent. They lowered the corn grain yield 19.1 percent the first year, 33.6 the second, but increased it 12.7 percent the third, 51.7 the fourth, and 35.2 percent the fifth year. The weight of corn stover was decreased by soybeans the first year, but was increased in the later years. Corn and soybeans are grown more economically both on the same land rather than on separate acres. Grown separately, the average acre production was 20 bu. of corn and 3,089 lb. of dry bean hay, but grown in combination, it was 33.9 bu. of corn and 4,020 lb. of hay. With the same number of stalks per acre (both corn and soybeans), there was but little difference in yield between alternate-row and "every-row" planting, although alternate-row planting is better for harvesting both corn and hay. Varying the rate of soybean seeding 10, 15, and 20 lb. per acre in corn gave no consistent difference in corn production, either grain or stover, but a higher rate of seeding increased the weight of soybean hay. Turning under soybeans where they were grown alone increased corn production the next year by 55.6 percent, 162.3 at the end of the second rotation, and 98.1 percent at the end of the third. Land on which the soybeans were grown alone and cut for hay gave an increase in corn yields the following year of 22.9 percent, 74.3 the end of the second rotation, and 83.9 at the end of the third rotation.

In a search for a summer legume more satisfactory than soybeans, all legumes and treatments used increased corn yields, 150 lb. of sodium nitrate being best, surpassing Austrian winter peas, crotalaria, and velvet beans in order. In a winter legume experiment to find a legume that would make good winter growth in south Louisiana and ripen seed enough before corn planting to reproduce itself, crimson clover, hop clover, sour clover, Singletary peas, giant bur-clover, and 150 lb. of sodium nitrate all gave increases in corn yields, amounts ranging from 3.1 to 8.9 bu. per acre. Bur-clover gave the best increase and crimson clover next, and the sodium nitrate lower yields than any other treatment. One year's trial showed creole peas, local wild vetch, and narrow-leaf vetch to be unsatisfactory for the purpose. The main objection to volunteer winter legumes is that most of them must stand until late in the spring to ripen seed, which makes corn too late for best quality and highest yields.

The relationship between predicted performance of double crosses of corn in one year with predicted and actual performance of double crosses in later years. H. K. HAYES, E. H. RINKE, and Y. S. TSIANG. (Minn. Expt. Sta.). (*Jour. Amer. Soc. Agron.*, 38 (1946), No. 1, pp. 60-67).—Twelve inbred lines of corn were tested in single cross combinations 1940-41. Single cross data were used to predict the performance of double crosses for each year for date silked, plant and ear height, ear length, kernel rows, percentage moisture, and acre yield in bushels. Variability for each character in the predicted double cross was estimated from means of four single crosses averaged for each prediction. Forty-nine double crosses with a considerable range of estimated variability were tested as actual double crosses and rated for variability. Reliability of the prediction method of estimating the performance of the 49 double crosses was determined by correlating the performance of predicted double crosses in 1940 and 1941 with each other and with actual performance as double crosses in 1943-44.

Highly significant r values were obtained for all six characters when predicted performance based on 1940 data was correlated with predicted performance based on 1941 data and when predicted performance based on either 1940 or 1941 data

was correlated with actual performance of double crosses. The r values between predicted performance in 1940 and 1941 for date silked, plant height, and ear length were significantly higher in one of two comparisons than between predicted and actual performance and in both comparisons for percentage moisture and yield. The r values for ear height and kernel rows were not significantly different in any comparison. Highly significant relationships existed between predicted variability in 1940 with that of 1941 for all six characters. Significant although not highly important r values were obtained between predicted variability for moisture and estimated variability of the actual double crosses. The r value for predicted variability of plant height in 1941 and the actual variability in 1943-44 inclusive reached the 5 percent point. Variability relations of the other character studied were not significant.

The 1945 Iowa corn yield test, J. L. ROBINSON and F. REISS. (Coop. U. S. D. A., et al.). (*Iowa Sta. Bul.* P79 (1946), pp. 597-642, illus. 1).—The 324 section entries in the 12 fields of the 1945 test were grown cooperatively and in the same groupings (E. S. R., 93, p. 277). Agronomic data including yields and performance score are tabulated for each entry, results over several years are summarized, and test methods and seasonal conditions are described. The average acre yield for the 9 fields harvested, 71.76 bu., compared with the 11-yr. average of 71.08 bu., and the average stand was 86.8 percent in 1945. Lodging averaged 28.3 and dropped ears 0.8 percent compared with 16.3 and 1.1 percent, respective 11-yr. averages. The highest-performing (average) section entries with scores in 1945 in regular hybrid and experimental hybrid classes, respectively, were for the northern section (District 1 only) Iowa Hybrid 4316, Goldline 279; north-central section Iowa Hybrid 306, Iowa Hybrid 4397; south-central section 118-H (Holden), C66 (Cornelius); and for the southern section ACE 43 and Maygold Exp. 5.

Performance tests of corn varieties and hybrids, 1945, J. S. BROOKS (*Oklahoma Sta. Bul.* 292 (1946), pp. 30, illus. 1).—Yields, maturity, grouping, percentage of stand, and for some tests percentage of lodging are reported again (E. S. R., 92, p. 785) for corn hybrids and open pollinated varieties totaling 139 grown in tests in 1945 at 8 locations. Average yields over several years are tabulated, and high-performing hybrids are listed.

South Dakota corn performance tests, 1945, K. F. MANKE (*South Dakota Sta. Cir.* 60 (1946), pp. 18, illus. 1).—Performance tests involving 96 corn hybrids and 12 open-pollinated varieties in different sections of South Dakota are reported on again (E. S. R., 93, p. 427). Tables show acre yields, moisture at harvest, and stands for each of 10 test fields in 1945 and temperature and precipitation data in each district for the 1945 corn-growing season.

A study of factors determining safe drying temperatures for seed corn, R. H. WILEMAN and A. J. ULLSTRUP. (Coop. U. S. D. A.). (*Indiana Sta. Bul.* 509 (1945), pp. 10, illus. 3).—Each of 268 150-ear samples of corn of various moisture contents, comprising inbred lines and single and double crosses, was divided into six 25-ear lots in tests 1937-41. Initial moisture was determined on one lot and the other five lots were dried in bins at 100°, 110°, 130°, and 140° F., respectively. The moisture content of corn placed in the drier was the prime factor in determining the safe air temperature for drying. Seed corn with an initial moisture content exceeding 25 percent should not be dried at air temperatures above 110°. Where the moisture content is 25 percent or below, 120° can be used with safety, and the extra 10° will reduce by one-fifth the time required to dry the corn to a moisture level necessary for safe storage. Relatively low germination (corrected by treatment with a seed disinfectant) was encountered in 1939 in certain test lots dried at the lower air temperatures (100° or 110°). It appeared due to seedling disease fungi tolerating the low drying temperatures but inhibited in development on seed dried at higher temperatures.

The effects of plowing under hairy vetch on the yield of cotton and on Lufkin fine sandy loam, E. B. REYNOLDS and J. C. SMITH. (Tex. Expt. Sta.). (*Jour. Amer. Soc. Agron.*, 38 (1946), No. 1, pp. 13-21, illus. 1).—Yield of hairy vetch was increased about 54 percent by application of P and K, which had no effect on the N and P content of the vetch. Significantly larger cotton yields were produced on soil receiving P and K, with or without vetch, than on untreated soil or soil on which unfertilized vetch was plowed under. The quantity of nitrate N in the soil during the growing season of cotton was roughly proportional to the amount of N added in the treatments. Soil treated with P and vetch had a greater nitrifying power than that receiving other treatments. Addition of P and K, with or without vetch, greatly increased the quantity of available P_2O_5 in the soil, although turning under unfertilized vetch apparently did not increase the availability of the native soil P. The nitrifying capacity of the soil and quantity of available P_2O_5 were correlated more highly with the yield of cotton than was the quantity of nitrates in the soil.

Nutritional factors affecting cotton rust, N. J. VOLK. (Ala. Expt. Sta.). (*Jour. Amer. Soc. Agron.*, 38 (1946), No. 1, pp. 6-12, illus. 5).—In fields that produced rusted cotton, soils were found to contain about one-half as much replaceable K as soils in fields that produced healthy cotton. Rust was eliminated by applying adequate quantities of K to the soil, but application of B, Cu, Zn, Mn, or Mg had no effect on rust. Sodium nitrate alleviated but did not eliminate rust in severe cases, believed due to the fact that Na may have partially substituted for K. High amounts of P increased severity of rust, probably by hastening maturity. Areas from which K was badly depleted by removal of several crops of peanuts produced severely rusted cotton. K was found to be more efficient when applied ahead of or at planting time than as a side dressing. High amounts of K, applied to cotton to prevent rust, retarded maturity of the cotton to the extent that boll weevil damage caused a decrease in yield.

Cotton varieties in the hill section of Mississippi, 1945, J. F. O'KELLY (Mississippi Sta. Bul. 426 (1945), pp. 7).—In tests previously referred to (E. S. R., 94, p. 846), varieties averaging about 500 lb. of lint per acre in five tests in 1945 were Hi-Bred 574 lb., Empire 547, Deltapine 540, Miller 532, Cleveland 54 517, Coker 100W-4 514, and Stoneville 5A 505 lb. Yields, acre value, and other agronomic data are tabulated for each test for 1945 and averages for the period 1941-45.

The longevity of cottonseed as affected by climate and seed treatments, D. M. SIMPSON. (U. S. D. A. coop. Tenn. Expt. Sta.). (*Jour. Amer. Soc. Agron.*, 38 (1946), No. 1, pp. 32-45, illus. 1).—Cottonseed, fuzzy and acid-delinted, and untreated and treated with a fungicidal dust, was stored at eight stations in the Cotton Belt and tested for moisture content and viability at 6-mo. intervals over 7 yr. Duration of safe storage depended upon climatic conditions at the storage location and ranged from 1 to 2 yr. in the lower Coastal Plains to 5 to 6 yr. along the northern rim of the Cotton Belt. Seed stored at other places in the main Cotton Belt was intermediate between these extremes in moisture content and in rapidity of deterioration. Fuzzy seed was slightly lower in moisture content than acid-delinted seed and averaged slightly higher in germination. Seed treated with the fungicide was higher in germination than untreated seed, probably because of control of mucedo and other fungi during the germination tests. The fungicide definitely was not injurious to the seed during storage. When samples of seed stored at Sacaton, Ariz., for 6 to 35 yr. were tested for germination, the oldest sample that contained viable seed had been in storage 25 yr. and contained 6 percent of viable seed.

The evaluation of individual plant selections from a natural population of guayule (Parthenium argentatum Gray), H. K. KRAMER. (U. S. D. A.). (*Jour. Amer. Soc. Agron.*, 38 (1946), No. 1, pp. 22-31).—The progenies of 42 guayule

plants individually selected from a natural population on the 02 Ranch in Texas were compared with a mass and a nonselected collection from the same location and with commercial strain 593 for percentage of aberrant and off-type plants, plant height and spread, percentages of rubber and resin, and date of first bloom. All progenies were from plants reproducing by facultative apomixis. Progenies showing introgression with mariola, *P. incanum*, had greater vigor, a lower percentage of rubber, and a later flowering habit than the better type progenies.

Effect of plant spacing and time of planting on seed yield of kenaf (*Hibiscus cannabinus* L.), J. C. CRANE and J. B. ACUÑA. (U. S. D. A. et al.). (*Jour. Amer. Soc. Agron.*, 37 (1945), No. 12, pp. 969-977, illus. 1).—Date and distance of planting of kenaf (E. S. R., 93, pp. 279, 429) under the conditions at the Cuban Agricultural Experiment Station had little influence on the degree of branching in either the *viridis* or *vulgaris* variety. Regardless of time of planting during the rainy season, flowering of kenaf does not take place at latitude 23° N. until September or October, when the length of the daily light period is shortened to about 12½ hr. Plantings for seed should be made during July or August, although in this experiment higher yields of seed per plant were obtained from July plantings. For high seed yields per unit area the crop should be drilled in rows 20 to 24 in. apart with 2 or 3 in. between plants in the row. For fiber, planting may be done from the beginning of the rainy season (April or May, depending upon local conditions) until July 15, but it is preferable to plant as early in this period as possible.

Effect of plant spacing and time of planting on fiber yield of kenaf (*Hibiscus cannabinus* L.), J. C. CRANE, J. B. ACUÑA, and R. E. ALONSO. (U. S. D. A. et al.). (*Jour. Amer. Soc. Agron.*, 38 (1946), No. 1, pp. 46-59, illus. 4).—Kenaf was planted at the Cuban Experiment Station during May, June, July, and August in 8-, 16-, and 24-in. rows at rates of 30, 15, and 10 lb. of seed per acre, respectively. With progressive delay in date of planting during the rainy season, ultimate plant height at blossoming time, weight per plant, and fiber produced per plant were successively smaller. As the distance between rows in any one planting was progressively widened, however, a concurrent increase occurred in the size and yield of fiber per plant. The acre yield of fiber from plants harvested during the flowering period decreased progressively as rows were wider, and also decreased as planting was successively later in the season. For maximum yield of kenaf fiber per unit area, the recommendation is that planting be done May 1 or earlier, in rows 8 in. apart, at the rate of 30 to 35 lb. of seed per acre.

Morphological variation in *Poa pratensis* L. as related to subsequent breeding behavior, D. C. SMITH and E. L. NIELSEN. (Wis. Expt. Sta. coop. U. S. D. A.). (*Jour. Amer. Soc. Agron.*, 37 (1945), No. 12, pp. 1033-1040, illus. 2).—Studies of the progeny behavior of 45 families of Kentucky bluegrass, representing selected strains and plants from pasture collections, were conducted for four generations in the field at Madison, Wis., and dealt with about 570 progenies, comprising 11,400 plants. Progenies from plants classified earlier as aberrant were generally higher in proportions of sexual or aberrant types than those from normal sister plants. Selection for normal or apomictic types and their propagation from seed did not appear to be highly effective in elimination of the tendency toward sexual reproduction. None of the families showed complete uniformity of type for two successive generations. Classification of sister plants for morphological similarities and differences evidently is not closely indicative of breeding behavior in subsequent generations when specific progenies are considered. Apomictic seed formation in Kentucky bluegrass appeared to be a relatively unpredictable character.

Lespedeza culture and utilization, R. MCKEE (U. S. Dept. Agr., *Farmers' Bul.* 1852, rev. (1946), pp. 14+, illus. 4).—A revision of the publication noted earlier (E. S. R., 84, p. 754).

Natural crossing and segregation in sericea lespedeza, *Lespedeza cuneata* (Dumont) G. Don, R. E. STITT. N. C. Expt. Sta., U. S. D. A., et al.). (*Jour. Amer. Soc. Agron.*, 38 (1946), No. 1, pp. 1-5, illus. 2).—Observation of selfed lines from a procumbent plant of *L. cuneata* indicated that the procumbent plants were homozygous. Natural crossing of procumbent plants with assurgent plants varied from 61.4 to 80.9 percent. Petaliferous flowers may naturally be either self- or cross-pollinated. Progeny from apetalous flowers indicated that they were always self-pollinated. Segregation in the F_2 suggested a complex type of inheritance. Variation in segregation between F_2 lines indicated that pollen from a number of assurgent lines was effective in bringing about natural crosses.

Now adapted varieties of spring oats, G. H. DUNGAN and O. T. BONNETT (Illinois Sta. Cir. 601 (1946), pp. 8).—Clinton, Vicland, Boone, and Tama are the best oats varieties for northern Illinois, according to tests at Mt. Morris. Clinton, Tama, Vicland, Marion, and Vikota are the leading varieties of central Illinois, as shown by tests at Urbana. Boone, Tama, Columbia, Clinton, Marion, and Vicland are the highest yielding commercial varieties for southwestern Illinois, as indicated by tests at Alhambra. Outstanding characters of these and other varieties in the tests are described, and practices for growing oats in Illinois are recommended.

Size of whole and cut seed and spacing in relation to potato yields, J. A. CHUCKA, A. HAWKINS, B. E. BROWN, and F. H. STEINMETZ. (Coop. U. S. D. A.). (Maine Sta. Bul. 439 (1945), pp. 33+, illus. 12).—Effects of size of whole and cut seed pieces on potato yields were studied at Presque Isle, Maine, 1943-45. The lots of whole tubers used as seed had the size ranges: 1-1¼ in., 1¼-1½, 1½-1⅞, and 1⅞-1¾. Cut seed used consisted of split large seconds (tubers 1⅞-1¾ in. cut into halves, and 1-oz., 1½-oz., and 2-oz. seed pieces cut from tubers 1¾-2½ in. smallest diameter). The varieties were Green Mountain, Katahdin, and Sebago. Consistent increases in yield were obtained during each year with increasing size of whole and cut seed used. Yield increases resulting from use of larger seed sufficed to more than pay for the extra cost of seed and for extra harvesting costs associated with higher yields. The largest whole tubers (1⅞-1¾ in.) and the largest (2 oz.) cut seed pieces showed the greatest return per acre. As the size of whole or cut seed was increased, number of stalks and of tubers per hill increased. Number of tubers per hill was associated with and was largely responsible for increase in yield resulting from use of larger seed pieces. Since part of the yield increase from use of larger seed is in production of tubers smaller than 1¾ in., use of large seed would appear more profitable to a seed grower than to a table-stock grower, because seed growers can sell profitably for seed purposes most tubers smaller than 1¾ in. in diameter.

Effects of seed spacing on yields and on the distribution of the resulting tubers in various size classes were studied in several localities, 1936-42, in experiments involving 6-, 9-, and 12-in. spacings; 1,000, 1,250, and 1,500 lb. per acre of 8-16-16 fertilizers, and one to eight varieties of potatoes commonly grown in Maine. Total yields rose as seed spacing was decreased, and average size of tubers produced decreased as the spacing narrowed. Average size of tubers produced tended to rise somewhat with the amount of fertilizer applied. Effect of season, however, appeared more important than spacing or fertilizer rate in determining average size of tubers produced. A seed grower evidently could use profitably a close spacing (about 6 in.), but a table-stock grower should use spacing not less than 9 in. When planting varieties like Houma which tend to set a relatively large number of tubers per hill, a spacing somewhat greater than 9 in. is suggested. However, when planting varieties as Katahdin, Irish Cobbler, and Sequoia, use of a 9-in. spacing during seasons of high yields will insure against production of excessively large tubers which tend to be hollow.

Potato production on northern Indiana muck soils, N. K. ELLIS (Indiana Sta. Bul. 505 (1945), pp. 16, illus. 6).—Methods outlined for growing potatoes on muck

soil are based extensively on experiments at the Northern Indiana Muck Soils Experimental Farm. Optimum conditions include a soil with a reaction pH 5.0 to 5.6, a well-prepared seedbed, and from 750 to 1,000 lb. per acre of 0-9-27 fertilizer or any equivalent with a 1 P : 3 K ratio (up 1,500 lb. under favorable conditions) used with the most convenient method of application. Seed stock should be of a good variety, as Katahdin, 3-4 oz. in weight, cut only once and through the apical end, and planted 2 to 4 in. deep, about May 1 to 15, in 24- to 28-in. rows. Cultivation should not injure the feeding roots, yet enough soil must be loosened to throw a 4 to 5 in. hill over the potato row. A good potato spray is 6-6-100 bordeaux, in which 6 lb. each of copper sulphate and hydrated lime are mixed in 100 gal. of water. Four lb. of calcium arsenate may be added to this mixture for each 100 gal. of water when it is necessary to control Colorado potato and flea beetles. The crop should be harvested when mature, injury by digger, basket, crate, or sack avoided, and the tubers handled carefully in storage and grading. Storage for seed is best about 32° to 38° F., and for table stock usually not below 40°, and a relative humidity of 90 percent is desirable.

Pre-harvest sampling of soybeans for yield and quality, E. E. HOUSEMAN, C. R. WEBER, and W. T. FEDERER. (Coop. U. S. D. A.). (*Iowa Sta. Res. Bul.* 341 (1946), pp. 805-826, illus. 2).—In 1941, just prior to harvest, 67 fields of soybeans in eight east central Illinois counties were sampled for yield, percentages of protein and oil, and iodine number of the oil. Protein and oil percentages and iodine number of the oil could be estimated satisfactorily, but estimating yield appeared more uncertain pending accumulation of information on adjusting for harvesting losses and other factors which cause the sample average yield to be too large. Yield of seed per acre differed with method of planting (width of rows), indicating for the season studied that rows about 2 ft. apart should have been used. The iodine number of the oil was lower for fields with wide rows than for drilled fields, this being attributed to difference in date of planting rather than method of planting. Conclusions were that two subsampling units should be taken per field and that the optimum size of subsampling unit is approximately 7 sq. ft. Other investigations, e. g., by Cartter and Hopper (E. S. R., 87, p. 510), have shown that after the pods are fully distended there is little or no change in yield or chemical composition, indicating that production and quality can be estimated well in advance of harvest. See also an earlier study on wheat fields by King and Jebe (E. S. R., 84, p. 184).

Varieties of winter wheat for Illinois, G. H. DUNGAN and O. T. BONNETT (*Illinois Sta. Cir.* 596 (1945), pp. 4).—Winter wheat varieties recommended because of good yields, high quality of their grain for commercial use, availability of seed, and general desirability for the section indicated include Ioturk, Pawnee, Wisconsin 2, and Marmin for northern Illinois; Pawnee, Tenmarq, Brill, Wisconsin 2, Prairie, and Fairfield for central Illinois; and Fulcaster, Fairfield, Clarkan, Wabash, Thorne, Goens, Trumbull, Fulhio, Prairie, and Fultz for southern Illinois. Acre yields, percentage of erect plants, and test weights are tabulated for these and other varieties in 1944-45 tests in the three sections of the State.

Varieties of wheat for North Dakota, T. E. STOA, L. R. WALDRON, R. H. HARRIS, and L. D. SIBBITT. (Coop. U. S. D. A.). (*North Dakota Sta. Bimo. Bul.*, 8 (1946), No. 3, pp. 10-20).—Behavior in experiments in recent years suggests Mida or Rival in the eastern part of the State where hard red spring varieties are grown, or Regent or Renown if a beardless early-ripening shorter-strawed variety is preferred. In central North Dakota, Rival, Pilot, Vesta, and Mida should yield best, Pilot, Vesta, and Regent being considered the most suitable if the crop is to be straight combined. Thatcher is preferred in extreme northwestern North Dakota. It lacks resistance to leaf rust, but this deficiency has generally been less serious in that area, and its yields have been satisfactory. Pilot and Vesta are also suited to

this area and thrive in other western counties, with Mida deserving consideration in the hessian fly area. Mindum is usually satisfactory in the durum growing areas unless rust is severe. Stewart affords rust protection and is recommended especially for the northern sections of the durum belt. Carleton is indicated where strong straw as well as high rust resistance is desired.

Cadet—a new beardless wheat, T. E. STOA (*North Dakota Sta. Bimo. Bul.*, 8 (1946), No. 3, pp. 21–22).—Cadet wheat, selected from a cross between Merit and Thatcher in cooperation with the U. S. Department of Agriculture and being distributed for increase in 1946, compares favorably with all other varieties of hard red spring wheat in resistance to stem and leaf rust. It is less resistant to stinking smut than Mida, Rival, Pilot, Regent, and Renown, being similar to Thatcher and Newthatch. It grows taller than other beardless wheats—as Thatcher, Regent, or Renown—but not as tall as Rival or Mida, does not shatter readily, has strong straw, and requires a few days longer to ripen. Because of its lateness Cadet is expected to find greatest usefulness in the more northern and northwestern sections of North Dakota, where ripening temperatures usually are not so high, and thus later varieties can more often realize their fullest yield. It is not high in test weight per bushel, somewhat resembling Thatcher and Regent. In milling and baking tests it has compared favorably with Thatcher and other wheats of good quality.

Vahart wheat, a new variety for Virginia, T. M. STARLING, S. A. WINGARD, and M. H. McVICKAR (*Virginia Sta. Bul.* 386 (1946), pp. 4, illus. 1).—Vahart, a head selection from Redhart, made in 1930 by T. B. Hutcheson, has proved to be one of the most resistant wheats to loose smut, although about as susceptible to leaf rust as other common varieties. It matures about 1 week later than Redhart, is slightly taller, and stands up as well or better. Vahart is as winter hardy as V. P. I. 131, Leap, or Forward, all of which it outyielded (average) at the station 1936–45 and the average of six localities in 1945.

Further experiments with the Iowa air blast seed separator for the analysis of small-seeded grasses, E. ÅBERG, R. H. PORTER, and W. A. ROBBINS (*Iowa Sta. Res. Bul.* 340 (1945), pp. 765–804, illus. 1).—Separation of immature, undeveloped, or empty florets from heavy (pure) seed of both redtop (*Agrostis alba*) and Kentucky bluegrass (*Poa pratensis*) (E. S. R., 79, p. 620) could be accomplished in a reasonably uniform manner by the use of the Iowa air blast seed separator (E. S. R., 84, p. 430). Some ergotized and smutted florets and other foreign material remain in the heavy fraction and must be removed by hand. The separator unit without the vernier scale on the valve dial can be set accurately to 0.5°. A valve equipped with the vernier can be adjusted accurately to 0.10°. The greater precision accompanies the finer adjustment. At any given dial reading a fairly uniform number of germinable seeds is removed with the light-weight fraction, but the valve opening may be so adjusted that the number of such seeds is relatively small and has little effect on the percentage of pure seed. The net result of this method of testing grass seeds is that the pure seed fractions are uniform, and the index value (purity $\times$ germination) is greater than when immature and undeveloped florets difficult to classify are retained with the pure seed. Variance of the replicates increases more or less proportionately as the size of working sample of either redtop or bluegrass seed is reduced below 1 gm., and although the differences in percentage of purity of a given set of replicates may exceed that expected from homogeneous samples, the differences become greater among small subsamples than are permissible for practical application. Half-gram subsamples of redtop seed or even 0.25 gm. fractions may be substituted for gram samples to determine percentages of pure seed, crop seed, weed seed, and inert matter with an important reduction in time needed to complete the analysis. Tenth-gram subsamples of bluegrass seed, whether analyzed by the Iowa or binocular methods, are deemed too small for use currently in seed testing work.

Commercial agricultural seeds, 1945, G. P. STEINBAUER (*Maine Sta. Off. Insp. 198 (1945)*, pp. 66-86).—Percentages of purity, germination, weed seeds, and hard seeds (in legumes) and number of noxious seeds per pound are tabulated for 146 samples of farm crops seed collected from dealers in Maine during 1945.

Final results of the Duvel buried seed experiment, E. H. TOOLE and E. BROWN. (U. S. D. A.). (*Jour. Agr. Res. [U. S.]*, 72 (1946), No. 6, pp. 201-210, illus. 1).—The longevity of seeds buried in the soil under natural conditions was studied in an experiment begun in 1902 by J. W. T. Duvel at the Arlington Experiment Farm, Rosslyn, Va., and terminated in the fall of 1941. Results of germination tests made in 1932 and 1941 on these buried seed are compared with earlier results (E. S. R., 52, p. 726). Of 107 species buried in 1902, 71 grew after 1 yr., 61 after 3 yr., 68 after 6 yr., 68 after 10 yr., 51 after 16 yr., 51 after 20 yr., 44 after 30 yr., and 36 after 39 yr. The general tendency was for lower germination from seeds from the 8-in. depth than from the 22-in. depth, and for the highest germination from the 42-in. depth. The 16 species, representing 10 plant families, having the highest germination in 1941 (more than 15 percent from at least one depth) were *Abutilon theophrasti*, *Ambrosia artemisiifolia*, *Convolvulus sepium*, *Datura stramonium*, *Ipomoea lacunosa*, *Lespedeza intermedia*, *Nicotiana tabacum*, *Oenothera biennis*, *Onopordum acanthium*, *Phytolacca americana*, *Potentilla norvegica*, *Robinia pseudoacacia*, *Rudbeckia hirta*, *Solanum nigrum*, *Trifolium pratense*, and *Verbascum thapsus*. Of the 20 other species that showed some life after 39 yr., 18 species had not more than 6 percent of germination at either depth. See also other notes by Goss and Brown (E. S. R., 82, pp. 42, 182).

Chemical weed control, R. F. GOUDEY (*Jour. Amer. Water Works Assoc.*, 38 (1946), No. 2, pp. 186-202).—A practical discussion of the use of chemicals in control of land weeds, emergent weeds, and aquatic weeds.

Land weeds and water-emergent weeds, the author concludes, are generally best controlled by the new 2,4-D compounds, but other chemicals have specific advantages for different purposes. Submerged aquatic weeds are generally best controlled with chlorinated hydrocarbons, employing higher doses than previously recommended (up to 50 gal. per acre), allowing much longer contact periods (up to 4 days) than formerly, and by observing necessary factors to avoid complaints of odors and tastes from consumers.

HORTICULTURE

Summary of State and Territorial plant quarantines affecting interstate shipments, M. A. THOMPSON (*U. S. Dept. Agr., Misc. Pub. 80, rev. (1946)*, pp. 116).—This revision of an earlier publication (E. S. R., 63, p. 736) presents in a comparable manner brief summations of regulations prescribed by the various States, District of Columbia, Alaska, Hawaii, and Puerto Rico concerning the movement of nursery stock, fruits, vegetables, soil, and related materials.

Fungicides and insecticides, 1945, E. R. TOBEY (*Maine Sta. Off. Insp. 198 (1945)*, pp. 87-96).—In the usual manner (E. S. R., 92, p. 788) there are presented the results of analyses of 84 samples of materials collected by the State Department of Agriculture in the calendar year 1945, together with a reprint of the State law.

Production of vegetable plants, A. D. HIBBARD (*Missouri Sta. Cir. 308 (1946)*, pp. 16, illus. 8).—General information is presented on construction of plant frames, covers for frames, manure, electricity and stoves as sources of heat, containers for young plants, soils and their preparation, disease control in the beds, sowing seed, handling the frames and plants, growing of tomato and sweetpotato plants, etc.

Four essentials for a good tomato crop, S. A. MCCRODY (*South Dakota Sta. Cir. 62 (1946)*, pp. 4, illus. 3).—Important considerations involved in the production of a good tomato crop are choice of adapted varieties, proper age and condition of

plants at time of transplanting to the field, and the use of a liquid fertilizer at the time of setting. Under South Dakota conditions Sioux, Stokesdale, Earliana, and John Baer have given consistently high yields. Maximum yields were obtained with 6- to 8-week-old plants in a vigorous status. A half-pint of a solution of 1 lb. of 4-12-4 fertilizer in 5 gal. of water poured on the soil around the freshly set plant increased yields materially.

"Hormones" tested on greenhouse tomatoes, R. E. NYLUND. (Minn. Expt. Sta.). (*Minn. Hort.*, 74 (1946), No. 3, p. 39).—Three so-called plant hormones were applied to the lower four blossom clusters of tomato plants growing in seven commercial greenhouses. For comparison, comparable clusters were treated with distilled water and certain others left unsprayed. The distilled water treatment was as effective as the chemical treatments, suggesting the possibility that the slight improvement in setting of the treated plants over the unsprayed checks was due to the accidental shaking of the plants as they were treated rather than to any chemical stimulus. Variety appeared important, with Potentate, the kind employed in the tests, capable apparently of setting a good crop under normal conditions.

The pollination of tree fruits and nuts, J. C. SNYDER (*Wash. State Col. Ext. Bul.*, 342 (1946), pp. 20, illus. 8).—Information is presented on the necessity of cross-pollination in fruits, role of insects in pollination, hand pollination of the apple including the collection, preservation, and handling of the pollen, methods of pollen application, and the use of bouquets of compatible bloom. In addition lists are presented of fruit and nut varieties grouped by species and arranged according to self-fruitfulness or self-unfruitfulness with suggestions as to adequate cross-pollinizers.

The growth and composition of the tops of peach trees in sand culture in relation to nutrient-element balance, D. S. BROWN (*West Virginia Sta. Bul.* 322 (1945), pp. 72, illus. 14).—Elberta peach trees were grown in sand cultures using 54 different treatments which included all possible combinations of N, P, and K provided at three concentrations (high, medium, and low) and of Ca provided at two levels (high and medium). The trees were harvested about 5 mo. after planting and their growth measured in terms of length and dry weight of shoots and in chemical composition.

N was the most important element in determining growth, with medium N most favorable. K and Ca were closely related and next to N in importance in affecting growth. With N in high or medium supply two treatments, namely, high K and medium Ca, and high Ca and medium K, were about equally effective.

Phosphorus was the least important of the four elements as a determinant of growth and there was no significant difference between high and medium P supply. Growth at low P level was greatly reduced. Acute deficiencies resulted under the conditions of a low supply of N, P, or K. Under the conditions of low K, growth improved with an increase in the Ca supply.

There were noted differences in the quantity of any given element in the leaves, shoots, and trunk, probably as a result of inherent differences in structure and function. Fundamentally it appeared that each element was antagonistic, at least potentially as to the accumulation of each of the others within the tops of the trees.

Varieties of fruit for South Dakota, S. A. McCrory (*South Dakota Sta. Cir.* 61 (1946), pp. 4, illus. 1).—There are presented lists of desirable varieties arranged in order of their time of ripening and according to the geographical section of the State to which they are best adapted. In addition, brief suggestions are offered as to source of stock, selection of sites, protection from wind, and culture.

Cherry and plum culture in Missouri, T. J. TALBERT (*Missouri Sta. Cir.* 307 (1946), pp. 16, illus. 1).—General information is presented on site selection, pollination requirements, varieties, planting, preparation of the soil, planting operations, fertilizers, pruning, general cultural care, etc.

Strawberry growing in Washington, J. C. SNYDER (*Wash. State Col. Ext. Bul.* 246, rev. (1946), pp. 24, illus. 5).—Information is presented on the status and distribution of strawberry growing, selection of sites and soils, soil management, fertilization, planting, varieties, control of insect and fungus pests, etc.

Utilization of nitrates by the coffee plant under different sunlight intensities, T. TANADA. (Hawaii Expt. Sta.). (*Jour. Agr. Res. [U. S.]*, 72 (1946), No. 7, pp. 245-258, illus. 3).—Leaves of young coffee trees, 2-10 mo. old, were found to contain relatively large amounts of nitrate nitrogen as compared with other plants. Furthermore, the nitrate content varied widely during the growing season. Examination at two seasons, summer and winter, of plants grown in water cultures under three different sunlight intensities indicated that nitrate accumulation in the leaves of the coffee plant is a normal process, and that the amount stored is largely determined by the amount of solar energy available to the plant at that time. In the presence of excess nitrates, the excess is stored by the plant.

Under the conditions the coffee plant grew better without than with heavy shade. The number of leaves per plant decreased with an increase in shading while leaf size increased with shading. Unshaded plants had larger trunks and root systems than did shaded plants. Increases in shading resulted in increased total N, soluble N, insoluble N, ammonia N, amide N, nitrate N, alpha-amino N, peptide N, and hemicellulose; and in decreased dry matter, soluble sugars, and starch. K and Ca tended to increase with shading, and during the cooler season P also tended to increase with shading.

Severe K deficiency resulted in an increase in soluble N due principally to an increase in the basic N fraction. At the outset of K deficiency soluble sugars accumulated, but later declined to normal values.

Severe P deficiency caused abnormal increases in total N, ammonia N, amide N, nitrate N, basic N, alpha-amino N, and peptide N, apparently an indication of a serious breakdown in N metabolism.

Leaf elongation and fruit growth of the Deglet Noor date in relation to soil-moisture deficiency, W. W. ALDRICH, C. L. CRAWFORD, and D. C. MOORE. (U. S. D. A.). (*Jour. Agr. Res. [U. S.]*, 72 (1946), No. 5, pp. 189-200, illus. 3).—The effects of depleted soil moisture on the rate of leaf elongation and root development of date palms were determined. On adequately irrigated palms the rate of leaf elongation during the period from late May to October was found to be between 4 and 5 cm. per day. A prolonged decrease in rate of leaf elongation of 0.5 to 1 cm. or more per day below that of frequently irrigated palms during late May, June, July, and early August, when the fruits were enlarging, was always accompanied by a reduced rate of fruit growth. The rate of increase in dry weight of the fruits was not immediately reduced as much as that of fresh weight, so that the percentage water content of the fruits was temporarily reduced. Delayed effects of appreciable water deficits in the palm were manifested in late summer in a reduced rate of increase in fruit dry weight, in approximately 2 weeks' earlier softening of the fruits, and (during one season) in a premature dropping of the fruits. Appreciable water deficits in the palms for a single period in the summer did not greatly increase the shrivel of ripe fruits.

Checking of fruits of the Deglet Noor date in relation to water deficit in the palm, W. W. ALDRICH, J. R. FURR, C. L. CRAWFORD, and D. C. MOORE. (U. S. D. A., et al.). (*Jour. Agr. Res. [U. S.]*, 72 (1946), No. 6, pp. 211-231, illus. 9).—Studies were made of the amount of checking, a type of cracking, in both harvested fruits and in those attached to the palm in relation to the internal water supply of the fruit and to the water in the medium surrounding the fruit. Dates detached from the palm in the morning developed checking after 4-hr. immersion in water. Weekly repetition of this test showed that the period of susceptibility to checking

began in June and ended in August, when the fruit color had changed from yellowish green to pink. The termination of susceptibility to checking coincided with the time that total weight of water in the fruit stopped increasing and began to decrease. When sucrose solutions were substituted for water, dates decreased in weight but checked nearly as readily as those in water. Fruits collected in the morning and coated with paraffin checked as readily in air as did comparable fruits immersed in water.

Fruits on detached strands, exposed to air of relative humidities of 76, 95, and 100 percent, checked more when the cut end of the strand was placed in water than when not so treated, suggesting the importance of water movement as a cause of checking.

The rate of transpiration of fruits during July and August varied from a maximum of 30-60 mg. of water per fruit per hour at midday to a minimum of 5-20 mg. in the early morning. A lower rate of transpiration noted in fruits on palms with inadequate soil moisture indicated that water deficits in the palm reduced the rate of water movement from the plant to the fruit.

In irrigation plots it was observed that the water deficit brought about by soil moisture deficiency reduced the percentage of fruits that developed checking.

Compositional changes in the date fruit during growth and ripening, G. L. RYGG (*U. S. Dept. Agr., Tech. Bul. 910 (1946), pp. 51, illus. 16*).—Changes were followed in two varieties from 6 weeks after pollination to the end of harvest. After the main period of cell division the development is divided into three stages. The first is characterized by a rapid increase in fresh weight and reducing sugar content, high water content, low pH, and a low total sugar content; the second by reduced rate of growth, reduced rate of accumulation of sugar accompanied by hardening of the seed, a high water content, and low pH; the third by reduced rate of gain in fresh weight and reducing sugars but a rapidly increasing rate for sucrose, increasing pH, decrease in water content, and a change in color from green to red or yellow, depending on variety. The third stage continues until ripening begins. An abnormally high water content during and immediately prior to ripening appeared to be associated with inferior quality in the ripe dates. Inadequate irrigation early in the growing season appeared to be conducive to excessive water content later. Reduction in leaf-to-fruit-bunch ratio increased the water content and reduced the size of fruit but did not affect the total sugar content in percentage of dry weight. Maximum water in quantity per fruit coincided with maximum susceptibility to checking of the skin, which may later develop into blacknose and detract from the market value. No gain in dry weight occurred after ripening of the fruit was well under way.

Cooperative rubber research in Costa Rica, T. J. GRANT (*U. S. Dept. Agr., Agr. in Americas, 6 (1946), No. 3, pp. 47-50, illus. 4*).—This report on the activities of the Cooperative Rubber Research Station at Turrialba, Costa Rica, presents information on the establishment of the enterprise, its purposes, equipment, and something of the accomplishments.

Tagua, W. R. SCHREIBER (*U. S. Dept. Agr., Agr. in Americas, 6 (1946), No. 3, pp. 51-53, 58, illus. 3*).—Tagua palms are found growing naturally in many densely forested regions on the Pacific coastal plains of Ecuador and other tropical portions of the Western Hemisphere from Peru to Panama. The nuts are used in the manufacture of buttons and for carving into curios, chessmen, etc. The paper discusses methods of harvesting and handling the nuts, large quantities of which are exported annually.

Effect of chloride on physical appearance and chemical composition of leaves of pecan and other native Oklahoma trees, H. J. HARPER (*Oklahoma Sta. Tech. Bul. 23 (1946), pp. 30, illus. 10*).—The chloride content of pecan leaves collected in late August or early September was found to be a satisfactory indication as to the

chloride situation in the soil in which the trees were growing. Leaf analysis was a less laborious method than that of soil sampling. When the chloride content of the leaves exceeded 0.6 percent, the trees are in danger of serious damage. A brown margin on pecan leaves was a good indication of severe chloride injury and the affected trees die usually in one or two seasons. Many of the scorched leaves showed more than 1.0 percent of chloride.

Pecans and other native trees were more subject to chloride injury than were annual plants, due in part to the nature of the plants and in part to the fact that tree roots penetrate more deeply into the soil. Annual weeds contained actually more chloride in their leaves than did injured trees leaves yet made vigorous growth on areas where all trees were dead. The ash content of leaves did not vary with the chloride content nor was potash content reduced by the presence of excessive amounts of chloride. In many soils large pecan trees were more susceptible to chloride injury than were small trees which had shallower root systems.

Walnut production in California, L. D. BATCHELOR, O. L. BRAUCHER, and E. F. SERR (*California Sta. Cir. 364 (1945)*, pp. 34, illus. 11).—This circular supersedes Bulletin 379 (E. S. R., 52, p. 344) and in a like manner presents information on climatic and soil requirements, varieties, propagation, planting, pruning, culture, irrigation, control of insect and fungus pests, harvesting, drying, marketing, etc.

Flower gardening, J. E. SMITH, JR. (*Missouri Sta. Cir. 306 (1946)*, pp. 16, illus. 4).—General information is offered on soil and fertilizer requirements, seed sowing, species and varieties for various uses, planning and care of the flower garden, insect and disease control, development and care of the rose garden, etc.

Growing garden roses, E. C. VOLZ (*Iowa Sta. Bul. P76 (1945)*, pp. 529-555, illus. 18).—General information is offered on types of roses for cold climates, locating and planning rose beds, desirable soils, planting stock, time and methods of planting, summer and winter care, control of insects and diseases, pruning, results of station variety tests with recommended varieties for Iowa planting, etc.

FORESTRY

Viability of pine seed after prolonged cold storage, N. T. MIROV. (U. S. D. A. coop. Univ. Calif.). (*Jour. Forestry*, 44 (1946), No. 3, pp. 193-195).—A total of 33 samples of seeds of 19 species of pine which had been stored in airtight 5-gal. tin cans at 40° F. were, after varying durations of time, withdrawn and following a period of stratification tested for viability by placing the flats in a greenhouse. The highest germination percentage, 90, was recorded in a lot of *Pinus ponderosa* which had been stored for 11.5 yr. A total of 17 samples ranged above 50 percent in viability despite the fact that the seed had been held in storage for 5.5 yr. or more. The results as a whole gave evidence that pine seed can be preserved for a long time provided the seed is held in airtight containers placed in storage at about 40°.

Natural reproduction of jack pine in Pennsylvania, W. C. BRAMBLE. (Pa. State Col.). (*Jour. Forestry*, 44 (1946), No. 3, p. 204).—Jack pine was found reproducing in central Pennsylvania from seed released following a fire which destroyed a 15-year-old mixed plantation. In another planting 20-year-old jack pines were found to have attained a maximum d. b. h. of 6.7 in. and a height of 32 ft. The capacity for rapid growth and for reproduction after fires suggest the value of the species for certain situations in the State.

Trees for reforestation in Indiana, D. DENUYL (*Indiana Sta. Cir. 306 (1945)*, pp. 11+, illus. 20).—General information is presented on desirable species, methods of planting, size and age of planting stock, location of sites, preparation of soil, protection from animals and fire, etc.

Rainfall and increment of Monterey pine in the Australian Capital Territory, M. R. O. MILLETT ([*Austral.*] *Commonwealth Forestry Bur., Leaflet 56 (1944)*,

pp. 26, illus. 5).—The difficulties of correlating rainfall with the growth of a perennial and changing crop are discussed. The general character of the rainfall is first considered and then analyzed for successively shorter periods, viz, annual rainfall irrespective of season, monthly rainfall irrespective of season, "seasonally effective" rainfall, and distribution of rainfall in rate per hour classes, based on hourly and quarter-hourly analyses. The problem of the optimum rainfall intensity is noted. The part played by other climatic factors is discussed, and reference is made to the conclusions of other workers in this field. Of all the meteorological factors taken singly, rainfall plays by far the most important role. The increment and rainfall curves in this study corresponded as well as similar curves published by workers in other countries for this and other tree species. Nevertheless, it is thought that the problem of growth of forest trees in relation to climate will not be near a very satisfactory solution until much more of the environmental complex is taken into account.

Lean and ellipticity of stems of Monterey pine in the Australian Capital Territory, M. R. O. MILLETT [*Austral. Commonwealth Forestry Bur., Leaflet 60 (1944), pp. 10, illus. 2*].—Measurements of the lean of the stems from 18 to 26 yr. of age are given for Monterey pine trees. The average lean at 18 yr. was 5.5° and varied by only 0.3° until 25 yr. when, as a result of very strong winds after heavy rains, it increased to 10.5° , many of the trees falling as a result of the severe leans. There was no significant difference in the leans of trees in the thinned v. control plots. The exaggeration of ellipticity of the stems as a result of these leans is discussed. The mean difference in the major and minor axes for the thinned trees increased from 0.45 in. in 1935 to 0.72 in. in 1942, whereas that for the controls decreased from 0.43 in. to 0.40 in. Notes are given on local prevailing winds causing the general lean of about 5° which must have developed during the life of the trees. The heavy rains and strong winds resulting in the severe lean and windfalls at the end of the experiment are discussed, and a comment is made on the practical importance of lean and ellipticity.

Pollen shed of Monterey pine, M. R. O. MILLETT [*Austral. Commonwealth Forestry Bur., Leaflet 59 (1944), pp. 8, illus. 1*].—The commencement, peak, and end of pollen shed of Monterey pine in two climatically different plantation areas in Australia are given and discussed. Air and soil temperatures associated with the first ripening of the δ flowers were the same in the two localities. The extension of the pollen season beyond the initial ripening was more closely related to sunshine, evaporation, and wind than to other meteorological factors.

[Forestry studies] (*U. S. Dept. Agr., Forest Serv., Caribbean Forester, 7 (1946), No. 1, pp. 1-36, Span. trans., pp. 25-35, Fr. abs., pp. 35-36; pp. 57-69, illus. 3, Eng. trans., pp. 64-68, Fr. abs., pp. 68-69*).—Included are two papers of significance to foresters: An Ecological Survey of the Polytechnic Institute Arboretum, by L. E. Gregory and I. Véléz; and El Cultivo del Eucalipto en la Sierra de Ecuador (The Planting of Eucalyptus in the Ecuador Sierra), by J. Marreño.

Station establishes fence-post farm to determine best preservative treatments, R. J. PRESTON (*Colo. Farm Bul. [Colorado Sta.], 7 (1945), No. 6, pp. 1, 5, 7, illus. 1*).—A test conducted by the college from 1912 to 1936 showed that the life of Engelmann spruce and lodgepole pine posts can be prolonged greatly by proper treatment with water-gas tar. Brushing with crude oil had no preservative value. A new test started in 1943 is designed to determine the effect of various preservatives and methods of treatment on lodgepole pine and aspen in the hope that it will be possible for farmers to use native materials and save over the purchase of Idaho cedar and other costly species.

Forest credit in the United States, 1930-1945, R. C. WATROUS and F. C. BELL (*U. S. Dept. Agr., Libr. List 23 (1946), pp. 10*).—A list of references grouped by years.

DISEASES OF PLANTS

The effect of colchicine and acenaphthene in combination with X-rays on plant tissue, III, M. LEVINE (*Bul. Torrey Bot. Club*, 73 (1946), No. 2, pp. 167-183).—This report (E. S. R., 94, p. 777) deals with the combined effect of 0.01 percent aqueous solution of colchicine and X-irradiation on root tips of the onion varieties Yellow Globe and Brigham Yellow Globe; detailed results are presented. The cytological phenomena immediately following this combined treatment were more intensified clumping, fragmentation, and extrusion of chromosomes. There appeared to be some visible effects on the resting nuclei in that the chromatic material was distributed near the nuclear membrane, leaving a clear zone around the nucleoli. No division stages were found at 24 hr. after irradiation; 3 or 4 days after treatment, the cells that were irradiated only began to divide, while those receiving the combined treatment exhibited but few nuclear divisions. The nuclei became homogeneously stained; the meristem was interspersed with many highly vacuolated cells. These studies do not favor the view that the greatest number of cellular injuries occur when irradiations are made at the time when the metaphases are most abundant. Colchicine apparently sensitized the cells to X-rays at the time when nuclear reconstruction began; this occurred about 48 hr. after exposure to colchicine had started. Onion roots covered with acenaphthene crystals and exposed to a saturated solution of this chemical produced only small hypertrophies after 48 hr. and little or no gross visible changes after shorter exposures; the effects on nuclear and cell divisions, however, appeared similar to those produced by colchicine. The combination of acenaphthene and X-rays (at 900, 1,500, and 3,000 r.) followed closely the results with X-rays alone. "Colchicine tumors" are not considered analogous to animal neoplasia or to plant overgrowths induced by bacteria or growth substances.

The combination of an exposure of 900 r. with a treatment using 0.01 percent aqueous solution of colchicine for less than 72 hr., or 1,500 r. with 48 hr. of colchicine, proved the most effective for arresting growth of fundamental plant tissues such as the onion root tip. It is suggested that more intensive studies be made with this drug combined with X-rays on tumors of animals and man. The fact that some animal tumors and simple but normal plant structures exhibited delayed growth after such treatment renders it necessary to obtain a suitable concentration of colchicine followed by a selective dose of X-rays which will tend to inhibit and to destroy cancerous tissue without interfering with normal life processes of the host. There are 3.5 pages of references.

On the effect of heteroauxine upon cells of diseased plant, K. SUKHORUKOV and B. STROGOV (*Compt. Rend. (Dok.) Acad. Sci. U. R. S. S., n. ser.*, 48 (1945), No. 3, pp. 210-212).—The author concludes from experiments with slices from the cortex of carrot roots that heteroauxin may cause a redistribution of the cell-division hormones in plant tissues. It is suggested that parasites may in a similar way modify the distribution of these hormones in the diseased plant by liberating auxins and thus creating conditions favorable to their nutrition and growth.

Mikroelement och bristsjukdomar hos odlade växter (Minor elements and deficiency diseases in cultivated plants), K. LUNDBLAD (*K. Lantbr. Akad. Tidskr.*, 84 (1945), No. 6, pp. 435-489; *Eng. abs.*, p. 485).—This contribution represents a compilation from the literature (over 3 pages of references—largely Swedish) on minor elements in plants. Section 1 takes up the 15 elements known to be necessary in plant nutrition; section 2 considers the different minor elements, with descriptions of the deficiency symptoms in crop plants; and section 3 deals with diagnostic and control matters.

The effect of pH on fungistatic activity of dinitro-o-cresol, P. W. BRIAN (*Jour. Soc. Chem. Indus., Trans. and Commun.*, 64 (1945), No. 11, pp. 315-316).—Using

Fusarium graminearum and *Trichoderma viride* as test fungi, the author presents results "showing that the fungistatic activity of dinitro-*o*-cresol (DNOC) solutions, adjusted to various pH values, is closely correlated with the concentration of undissociated DNOC. In fact, the fungistatic efficiency of aqueous DNOC solutions can be accounted for on the assumption that the DNOC anion has one-fortieth the toxicity of the undissociated molecule. It is suggested that the observed increases in insecticidal activity of DNOC-petroleum oil winter washes at low pH can also be accounted for by the increased concentration of undissociated DNOC, rather than by the increased concentration of DNOC in the oil phase. The concentration of DNOC in the oil phase is in fact an indirect measure of the concentration of undissociated DNOC."

Molecular weights and other properties of viruses as determined by light absorption, G. OSTER (*Science*, 103 (1946), No. 2671, pp. 306-308, illus. 3).—Virus solutions exhibit visible opalescence due to light scattered by the virus particles; this results in a decrease in light transmission. The light-scattering—and therefore light-absorptive—powers of solutions are very sensitive to changes in particle size, shape, and interaction. The method was used in studies with two virus preparations known to possess quite different particle sizes, viz, the influenza and tomato bushy stunt viruses. This technic was also followed in determining the isoelectric point from the point of maximum coagulation of virus (tobacco mosaic) particles; it was even possible to distinguish between the isoelectric points of this virus and many of its strains. The optical method is now being used to study irreversible polymerization and the formation of liquid crystals of tobacco mosaic virus; it seems to offer promise also in investigations of antibody-antigen reactions involving viruses as the antigens.

De betekenis van de serologie voor het virusonderzoek [The value of serology for virus investigations], E. VAN SLOOTEREN ([Netherlands] *Lab. Bloembollen Onderzoek*, Lisse, No. 72 (1943), pp. 21+).

The nutrition of phytopathogenic bacteria.—I, Minimal nutritive requirements of the genus *Xanthomonas*, M. P. STARR (*Jour. Bact.*, 51 (1946), No. 2, pp. 131-143, illus. 3).—The minimum nutritive requirements of 113 isolates of plant-pathogenic bacteria representing 30 species and varieties of *Xanthomonas* were determined under conditions of controlled inoculum, carefully cleaned glassware, and pure components of the media. In this way it was learned that most—though not all—the species could grow to some extent in the simplest medium used, viz, NH_4Cl , glucose, and salts. Methionine, glutamic acid, and niacin in various combinations served to furnish the stimulative and essential growth factors necessary for prompt development of the more exacting species. Growth in these simple media offers promise of utility as a taxonomic character at the generic and specific levels. There are 36 references.

Dispersion of small organisms: Distance dispersion rates of bacteria, spores, seeds, pollen, and insects—incidence rates of diseases and injuries, D. O. WOLFENBARGER (*Amer. Midland Nat.*, 35 (1946), No. 1, pp. 1-152, illus. 47).—The distance dispersed by organisms has not only great scientific interest, but is also very important in planning control measures; this double significance offers a challenge for quantitative research. The present paper was prepared in an attempt to meet this challenge, at least in part. Following introductory statements—including terms, conceptions, and methods used in the study, the author considers in part 1 the dispersion and incidence rates—horizontal dispersion of inanimate objects, viruses, plants, and insects and vertical dispersion of micro-organisms and insects. In part 2, generalizations, he discusses dispersion-distance in relation to dispersion-time reciprocity and differential, direction of dispersal, factors influencing dispersion. migration of small organisms, agencies or means of dispersal, density levels at the

source, sampling characteristics, dispersions for control measures, considerations of vertical and horizontal dispersion, vertical dispersions and generalizations, and vertical strata. An appendix presents regression formulas used for determining the calculated or curve values used in the figures. About nine pages of references and a subject index complete the monograph.

The relation of soil temperature to the development of armillaria root rot, D. E. BLISS. (Calif. Citrus Expt. Sta.). (*Phytopathology*, 36 (1946), No. 4, pp. 302-318, illus. 8).—Plants were grown for 181 to 438 days in the greenhouse in five soil-temperature tanks at controlled temperatures from 7° to 38° C.; air temperatures ranged mostly between 21° and 27°. The optimums for root growth in group A plants—Lovell peach, casuarina, California peppertree, geranium, and Royal apricot—were 10° to 17°; those for group B plants—Koethen and Homosassa sweet orange, Standard sour orange, Sampson tangelo, and rose—were 17° to 31°. Top growth of citrus was retarded at 10° to 12°, the new leaves being small and very chlorotic; largest top growth occurred at 27° to 31°. The minimum for root growth was 12°; the maximum, slightly below 38°. Top growth of peaches and apricots was greatest at a soil temperature of 31° and least at 10°; that for geraniums was greatest at 17° and least at 31°. Top growth of peppertrees was retarded at 10° but was vigorous and nearly equal at 15° to 30°. The growth rate of roses increased from 8° to 28°; that for casuarina was retarded at 7° and most rapid at 27°.

Rhizomorphs of *Armillaria mellea* grew most rapidly in sterile deep nutrient agar at 19.7° and 24°. Slight growth occurred at 5° and 31°, but none at 36°. The fungus remained viable in woody inoculum in soil held at controlled temperatures of 7° to 28° for 181 to 438 days. The greatest development of rhizomorphs in nonsterile soil was evident at the lowest experimental temperature. Pathogenesis in artificially inoculated test plants was observed at 7° to 25°; the optimum range in plants of group A was 15° to 25° and that for group B 10° to 18°. The greatest resistance was shown by all plants at the temperatures most favorable to root growth. The upper critical temperature for pathogenesis in all susceptibles was tentatively placed at 26°. In southern California the prevalence of this root rot throughout the coastal region and its supposed absence in the inland desert areas are apparently related to differences in soil temperature. In the coastal region, pathogenesis in group A plants would develop most rapidly from spring to fall; in group B plants, most rapidly from late fall until spring.

Further studies on the Erysiphaceae of China, F. L. TAI (*Bul. Torrey Bot. Club*, 73 (1946), No. 2, pp. 108-130, illus. 13).—A careful comparative study of available collections of most species of these powdery mildew fungi thus far reported from China led the author to believe it advisable to keep the collective species *Erysiphe cichoracearum*, *E. polygoni*, and *Microsphaera alni* as emended by Salmon. Climatic conditions were found to affect the morphological characters of *Uncinula delavayi* at Kunming. As a result of this study several species were reduced to synonymy. *U. koelreuteriae* is transferred to the genus *Typhulochaeta*, and one variety of *Erysiphe*, two species of *Microsphaera*, and one variety and one species of *Uncinula* are described as new.

Some resupinate polypores from the region of the Great Lakes, XVI, D. V. BAXTER (*Mich. Acad. Sci., Arts, and Letters, Papers*, 30 (1944), pp. 175-192, illus. 56).—It is believed that no systematic attempt has previously been made to compare the reactions (on similar substrata) of a large group of isolates from many different species of resupinate polypores collected from widely separated localities of North America and found on a great variety of woods. The present paper is based on a large number of species and races obtained in culture from the Michigan collections; each isolate was placed on red gum and white pine blocks regardless of the kind of wood originally attacked, and the macroscopic effects on these test

woods were noted and records of the mycelial growth on malt extract in petri dish cultures secured. Distinctions that can be made among many species and races of the white resupinate polypores in such cultures were recorded in key form in the previous paper of the series (E. S. R., 92, p. 674); the key there presented is continued in this paper, which deals with the light- and dark-colored species of the group. The comparative appearances of the fungi in petri dish cultures are illustrated.

A new bean mosaic in Idaho, L. L. DEAN and C. W. HUNGERFORD. (Idaho Expt. Sta. et al.). (*Phytopathology*, 36 (1946), No. 4, pp. 324-326).—The authors report from Idaho a new virus causing symptoms resembling those of common mosaic but differing in its ability to infect certain varieties immune to the common form. The University of Idaho Great Northern selections 1, 56, 59, 81, and 123 and Idaho Refugee and U. S. No. 5 all proved resistant to the new strain; Great Northern U. I. 15, Red Mexican U. I. 3, Red Mexican U. I. 34, Michelite, Robust, Red Kidney, Bountiful, and Burtner were susceptible. Richards and Burkholder have reported a similar new bean virus in New York State (E. S. R., 90, p. 649).

Sporidial fusion in *Ustilago maydis*, D. H. BOWMAN. (U. S. D. A. coop. Univ. Wis. and Ohio Expt. Sta.). (*Jour. Agr. Res. [U. S.]*, 72 (1946), No. 7, pp. 233-243, illus. 2).—Sporidial fusions in cultures of the corn smut fungus were markedly influenced by temperature and the nutritive value of the media; they were sufficiently numerous to be readily detected after 20 hr. at 24° C. in distilled water and after 15 to 20 hr. at 20° to 24° in 1-percent malt-extract solution. Initiation of the binucleate phase followed no fixed method but resulted from the fusion of any two compatible haploid cells—sporidial or hyphal. In no case were the binucleate hyphae seen to revert to sporidial production. The end cells of binucleate hyphae each uniformly contained a single pair of nuclei. The protoplasmic contents of older binucleate cells and of fused sporidia appeared to be in various stages of disintegration. In some cases the cell contents were apparently normal; in others they were either partly disintegrated or entirely lacking. The rapidly growing apical cells of binucleate hyphae and young sporidia had a pronounced affinity for the various dyes used; older cells and old fused sporidia did not.

Corn seed treatment in Oklahoma, J. H. McLAUGHLIN (*Oklahoma Sta. Bul.* 294 (1946), pp. 14).—This contribution advocates corn seed treatment as seedling-emergence insurance and backs up the recommendations with experimental data from tests over a 3-yr. (1943-45) period, showing the value and costs of the treatment and the larger numbers of fungus infections in the seedlings from untreated seed.

Variation and variability of *Fusarium lini*, the fungus causing flax wilt: A review, H. H. FLOR (*North Dakota Sta. Bimo. Bul.*, 8 (1946), No. 3, pp. 31-32).

A seedling disease of flax caused by *Macrosporium* sp., J. B. LOUGHNANE (*Nature [London]*, 157 (1946), No. 3983, p. 266).—A brief preliminary note on this apparently new disease.

On the identity between yellow of kok-saghyz and yellow of aster and its possible relation to big bud in tomato, K. S. SUKHOV and A. M. VOVK (*Compt. Rend. (Dok.) Acad. Sci. U. R. S. S.*, n. ser., 48 (1945), No. 5, pp. 365-368).—Yellows of kok-saghyz is virus-induced and transmissible from diseased to healthy plants by grafting; its vector is *Macrosteles quadripunctata* Kbm. According to the literature (14 references) and studies by the authors, this virus in the U. S. S. R. attacks up to 45 plant species in 15 families. Comparisons of the vectors and hosts led the authors to believe the kok-saghyz virus identical with or a related strain of the aster yellows virus of America; similar comparisons also revealed its identity or close affinity to the causal agent of the big bud disease of tomato.

Mosaic on Leguminosae, A. M. VOVK (*Compt. Rend. (Dok.) Acad. Sci. U. R. S. S.*, n. ser., 48 (1945), No. 3, pp. 213-215).—The author briefly reviews the litera-

ture (22 references) on virus diseases of legumes, notes the various leguminous host plants which he has observed infected with mosaic, and briefly summarizes his cross-inoculation tests via the green peach aphid and sap from diseased plants. He believes that the mosaic on garden pea, sweet pea, and bean are all due to *Pisum virus 2* of Doolittle and Jones; the mosaic virus of bean and pea induced no morbid symptoms on inoculation by these two methods to cucumber seedlings or to *Nicotiana tabacum* and *N. glutinosa*.

Studier över de Svenska potatisfältens insektfauna och dess betydelse för spridning av virussjukdomar.—I, Hemiptera, förekomst och utbredning [Studies of the insect fauna of Swedish potato fields and their role as vectors of virus diseases.—I, Hemiptera, incidence and geographical distribution], F. OSSIAN-NILSSON ([Sweden] Statens Värtskyddsanst. Meddel. 39 (1943), pp. 72, illus. 18; Ger. abs., pp. 69–70).—A survey of the hemipterous fauna of the potato fields of Sweden, as well as the results of the author's study of their distribution in that country. There are 53 references.

De herkenning van virus-ziekten der aardappelen langs serologische weg [Determination of virus diseases of potatoes by serological methods], E. VAN SLOTEREN ([Netherlands] Lab. Bloembollen Onderzoek, Lisse, No. 76 (1944), pp. 8, illus. 3).

Spray and dust treatments of potato demonstration plots, 1945, G. A. BRANDES and E. M. SWISHER (*North Dakota Sta. Bimo. Bul.*, 8 (1946), No. 3, pp. 33–39).—This paper is based on spray and dust treatments of demonstration plots of potatoes on farms of grower cooperators at 15 well-distributed points in the potato area of North Dakota in 1945. Of the four most important insect pests, the six-spotted leafhopper proved most difficult to control, with the potato leafhopper, potato flea beetle, and Colorado potato beetle more easily combated in the order named. Sprays and dusts containing DDT controlled these pests better than any of the other insecticides tried. The organic thiocarbamates Dithane and Fermate were more effective against alternaria early blight than the fixed coppers; the generally good control of flea beetles by DDT also resulted in a lower incidence of early blight. Late blight was not of general occurrence. Yield differences in most of the dust plots were only slightly significant, but the Cu-DDT plots outyielded the Cu-arsenical ones by 8.3 to 44.3 bu. per acre; DDT-Pyrocide-Cu and Dow F-508 dust slightly outyielded DDT-Cu. With DDT assumed at 100 percent, the average percentage ratings for the dust groups were DDT-Cu 100, DDT-Pyrocide-Cu 102.3, Dow F-508 102.2, arsenical-Lethane-Cu 96.8, and arsenical-Cu 89.3. Yield variations were small and of little significance in the Dithane-DDT, Fermate-DDT, Copper A-DDT, Dithane-arsenicals, and Cuprocide-DDT spray plots, but Dithane-DDT outyielded the general group of Cu-arsenicals by 22.2 to 62.3 bu. per acre and the check receiving one application of arsenical dust and no fungicide by 73.8 bu. per acre. The average percentage yields for the spray material groups were Dithane-DDT 100, Fermate-DDT 99.1, Copper A-DDT 97.5, Dithane-arsenical 96.5, Copper A-arsenical-Lethane 96, Cuprocide-DDT 94.7, Cu-arsenical 88.6, and check 81.9. The combinations of all materials used are given.

Evaluation of various spray and dust materials in the control of insects and of the fungus causing early blight of potatoes, J. A. MUNRO and W. G. HOYMAN (*North Dakota Sta. Bimo. Bul.*, 8 (1946), No. 3, pp. 23–30).—In tests of the effectiveness of some of the newer insecticides and fungicides at Grand Forks and Park River, N. Dak., (1945), in which 17 dusts and 16 sprays were used, the six-spotted leafhopper showed the greatest resistance; the potato leafhopper, potato flea beetle, and Colorado potato beetle were lower in resistance in the order listed. Treatments containing DDT averaged the best in insect control, combinations of DDD (dichlorodiphenyldichloroethane) with arsenicals ranking lower. Aphids became

moderately abundant only on plots with arsenicals alone, indicating that the other insecticides used had a controlling effect on them. The prevalence of ladybird beetles and lace wing flies appeared to be correlated predominantly with the presence of the aphids on which they fed. Dust treatments containing DDT as the insecticide gave significantly better control of insects at Park River than corresponding spray treatments, while at Grand Forks the difference in control between the two methods was negligible. It is possible that the sulfur, Zerlate, or additional amount of Cu included in certain treatments added to the effectiveness of DDT in insect control.

Fungicides applied as sprays were more effective in preventing alternaria early blight than those applied as dusts. Except for the three materials containing an excessive amount of Dithane, the lowest infection at Grand Forks and Park River occurred on plots sprayed with Zerlate; Copper A and Copper A plus Zerlate were equally as effective at Park River as Zerlate. The best combination tested at Grand Forks for controlling both insects and early blight was Zerlate plus DDT spray; these were also included in the most effective dust. At Park River, the most effective combinations for the dual control were dusts containing Zerlate and DDT; Copper A and DDT; and Copper A, Zerlate, and DDT. The compositions and concentrations of the materials used are given.

Two aids for the study of potato-late-blight epidemiology, W. D. THOMAS, JR. (Minn. Expt. Sta.). (*Phytopathology*, 36 (1946), No. 4, pp. 322-324, illus. 1).—Potted potato plants grown in the greenhouse and protected from accidental infection were exposed in potato fields for periods of 4 hr. or overnight and subsequently incubated at about 21° C. and 100 percent relative humidity. Late blight lesions developing on the plants indicated the number of viable *Phytophthora infestans* spores falling on plants during the exposure period. The temperature among the leaves of potato plants in the field was in some cases as much as 10° lower than at 5 ft. above them; the relative humidity among the vines was also consistently higher than at 5 ft. above—sometimes as much as 20 percent.

The potato-rot nematode *Ditylenchus destructor* Thorne, 1945, attacking potatoes in Prince Edward Island, A. D. BAKER (*Sci. Agr.*, 26 (1946), No. 3, pp. 138-139).—The author presents "clear evidence that the potato rot nematode is present in a small portion of one field in Prince Edward Island."

Verslag van het serologische onderzoek betreffende de vergelingsziekte der suikerbieten 1942-1943 [Contribution to the serological investigation of curly top of sugar beets, 1942-43], H. L. BOOIJ, M. P. DE BRUYN OUBOTER, M. C. CREMER, and E. VAN SLOOTEREN ([*Netherlands*] *Lab. Bioembollen Onderzoek*, Lisse, No. 73 (1944), pp. 28+, illus. 7).

El efecto del "carbón" en las cañas de distintas variedades durante el año agrícola 1944-1945 [The effect of smut on different sugarcane varieties during the crop year 1944-45], W. E. CROSS (*Bol. Estac. Expt. Agr. Tucuman*, No. 55 (1945), pp. 31).—The author discusses the commonly planted varieties which are more or less seriously attacked by smut, resistance and immunity among varieties, the relation between genetic origin of a variety and its degree of resistance, varieties which in commercial plantings may be classed as practically immune and those which are attacked only slightly, and the progress of the disease in P. O. J. 36.

Bud blight of soybean caused by the tobacco ring-spot virus, W. B. ALLINGTON. (U. S. D. A. and 24 expt. stas.). (*Phytopathology*, 36 (1946), No. 4, pp. 319-322, illus. 2).—The author verifies earlier reports that tobacco ring spot virus infects and severely injures soybeans in areas of the midwestern United States, symptoms varying with stage of plant growth at infection time. Young plants show a characteristic curving of the terminal bud, bronzing of the leaves, browning of the pith, slight defoliation, poor seed set, and delayed maturity; heavier infection is more

evident at blossoming time and results in extensive losses. The pods present a dark irregular blotched appearance and usually fall off in great numbers. Unsound seed is produced. The symptoms on other hosts such as cucumber, bean, and tobacco are characteristic of those induced by this virus. Thermal inactivation and plant immunity tests gave further evidence of its identity. An insect vector is being sought.

A "frenching" response of tobacco seedlings to isoleucine, R. A. STEINBERG. (U. S. D. A.). (*Science*, 103 (1946), No. 2672, pp. 329-330).—A shortened stem and excessive development of axillary buds leading to a "witch's broom" type of growth followed use of isoleucine in the substrate—the symptoms varying with the concentration of this amino acid. The abnormalities described are characteristic of the tobacco disease called frenching, the cause of which is unknown.

The effects of infection of tobacco plants (*Nicotiana tabacum*) with tobacco mosaic virus on some of the properties of the protein present in the leaves, J. W. H. LUGG and R. J. BEST (*Austral. Jour. Expt. Biol. and Med. Sci.*, 23 (1945), No. 3, pp. 235-239).—Infection of tobacco with mosaic virus led to a progressive change in the physical properties of the leaf proteins, these tending to precipitate much more readily from borate buffer at pH 9.2 when a mixture of 0.8 volume of alcohol and 0.2 volume of ether was added. The change appeared not to be reflected in any marked change in the amino acid composition of the proteins. Little change in composition merely in consequence of admixture of the normal leaf proteins with virus protein could be anticipated because—although these differ markedly in composition—the virus protein probably did not represent over about 5 percent of the total protein in the infected leaves. Of the N in the whole protein of healthy leaves, the percentage represented by amid was 5.48, by tyrosine 2.63, by tryptophan 1.82, by cyst(e)ine 1.35, and by methionine 1.45. These values are similar to those reported for the leaf portions of other flowering plants.

On the rate of inactivation of tobacco mosaic virus by potassium salicylate, R. J. BEST (*Austral. Jour. Expt. Biol. and Med. Sci.*, 23 (1945), No. 3, pp. 221-226, illus. 2).—The inactivation rate for this virus by potassium salicylate at pH 7 and 30° C. followed a logarithmic course at salicylate concentrations of 0.51, 0.54, 0.61, 0.68, 0.8, and 1.0 M; below 0.3 M no inactivation could be detected within 48 hr. Loss of birefringence of flow, opalescence, and ability to form paracrystals paralleled the loss of infectivity. Between 0.3 and 1.0 M salicylate, inactivation was accompanied by precipitation of denatured protein, the amount increasing to a maximum at about 0.65 M and decreasing at higher concentrations until at 1.1 M the denatured protein was completely soluble. Dilution of such a solution resulted in the isolation of denatured protein equivalent to 69 percent by weight of the original virus. The denatured protein contained C, H, N, and S in amounts similar to the original virus but was devoid of P, the salicylate having split off the nucleic acid from the virus. The half-life periods of the virus were found to be 9, 18, 53, 97, 165, and 354 min. at 1.0, 0.8, 0.68, 0.61, 0.54, and 0.51 M salicylate, respectively. The necessary contact time for reducing 1 mg. of virus to one active particle was calculated from the half-life periods and found to be 6.5, 13, 38, 70, 119, and 255 hr. for the above concentrations of salicylate.

The diagnosis of bacterial black chaff of wheat, W. A. F. HAGBORG (*Sci. Agr.*, 26 (1946), No. 3, pp. 140-146, illus. 4).—A diagnostic procedure is presented which is reported to be effective and to obviate the difficulties experienced by many workers. All the essential parts of the method can be performed with equipment ordinarily available in the plant pathology laboratory. It consists essentially in the examination of macroscopic and microscopic portions of the diseased tissues, isolation of the causal organism, and its identification either by a study of its pathogenic or its serological reactions, coupled with a study of its morphology and physiological properties.

The effect of chemical soil treatments on the development of wheat mosaic, F. JOHNSON. (West. Wash. Expt. Sta.). (*Ohio Jour. Sci.*, 45 (1945), No. 4, pp. 125-128).—The author studied the action of certain chemicals commonly used as insecticides and nematocides on the development of winter wheat mosaic. Samples of a specified amount of virus-infested soil were subjected for 7 days to the gases of five volatile liquids and two solids; in addition, one contact insecticide was used. Calcium cyanide when applied in the largest amount and carbon disulfide, chloropicrin, and methyl bromide at each of the three concentrations employed gave complete control of mosaic. Ethylene dichloride reduced the incidence at the two larger dosages, but ethyl chloride gave no control at all. The naphthalene fumes and rotenone dust, when mixed with the soil, also completely eliminated the disease. The action of these chemicals was believed to be on the vector rather than on the virus.

Influence of time, rate, and depth of seeding on the incidence of root rot in wheat, F. J. GREANEY (*Phytopathology*, 36 (1946), No. 4, pp. 252-263).—Field tests in Manitoba (1936-44) on the relation between date, rate, and depth of seeding of spring wheat and the incidence of root rots by *Helminthosporium sativum* and *Fusarium* spp. indicated that early seeding reduces the incidence and increases the yields. Soil temperature as related to date of seeding was positively associated with root rot infection and negatively related to yields. Low soil temperature (early seeding) was thus associated with low disease incidence and high yields. The effect of high soil temperature on the incidence of root rot proved an important factor in reducing yields of late-sown crops of spring wheat. A close association was found between rate of seeding and development of root rot, its severity increasing with thickness of planting; deep planting also increased the incidence. As a factor in the control of root rot, depth of seeding was more important in some varieties than in others. These findings establish the practicability of reducing losses from these common root rots in Manitoba by seeding spring wheat at the earliest feasible date, and not too thickly or deeply.

Growth and overwintering of *Xanthomonas vesicatoria* in association with wheat roots, S. DIACHUN and W. D. VALLEAU. (Ky. Expt. Sta.). (*Phytopathology*, 36 (1946), No. 4, pp. 277-280).—*X. vesicatoria*, *X. phaseoli* *sojense*, and *Bacterium medicaginis phaseolicola* produced colonies on the surface of roots of seedlings of wheat, tomato, bean, and soybean grown aseptically in petri dishes within 2 days after the roots had been dipped into bacterial suspension. In each of five trials during December 11, 1943-March 14, 1944, *X. vesicatoria* was recovered from the roots of wheat growing out of doors in nonsterilized soil infested with the organism; it was not recovered on April 14. Attempts to isolate the other two species were unsuccessful.

Vegetable seed treatment for Oklahoma, J. H. McLAUGHLIN (*Oklahoma Sta. Bul.* 293 (1946), pp. 24).—This bulletin presents results of tests on the value of chemical treatment of vegetable seeds in Oklahoma; they were made on beet, cabbage, cantaloup, carrot, cucumber, eggplant, lettuce, lima bean, okra, pea, pepper, potato, radish, salsify, edible soybean, spinach, sweet corn, tomato, turnip, and watermelon seed. Recommendations based on these tests are as follows: Chemical seed treatment often results in marked increases in seedling stands; it is especially valuable on spinach, beet, pea, lettuce, carrot, salsify, sweet corn, cucumber, cantaloup, and watermelon seed when environal conditions after planting are unfavorable to seedling development. Although some kinds of seed do not respond as markedly as others to treatment, it should be a standard practice on all vegetable seed. The chemicals used are inexpensive and easy to apply. Most vegetable seed can be treated for approximately a cent per pound. Seeding rates with treated seed should be reduced to avoid stands that are too thick. Only a few chemicals are needed—

Arasan, Spergon, Semesan, Cuprocid, and Vasco 4 (zinc oxide) are those most widely used for vegetable seed treatment; Arasan and Spergon have shown the most outstanding and consistent increases in seedling stands and are also less poisonous and therefore less dangerous to use. Treated seed may be saved for later plantings or for use the following season. For specific recommendations on the control of diseases of most vegetables commonly grown in the State, the reader is referred to Circular 117 (E. S. R., 93, p. 46).

Our experience with seed treatments in western Washington agriculture, C. J. GOULD. (Wash. Expt. Sta.). (*West. Canner and Packer*, 37 (1945), No. 4, pp. 47, 49, 51, illus. 4).—The author presents the results of a seed treatment program carried out on some 19 garden crops, using many of the newer fungicides, such as Ceresan, red and yellow Cuprocid, Semesan, Spergon, AAZ Zinc Oxide, Barbak C, New Improved Ceresan, Arasan, Fermate, Dow 6-B, Dow 5, and USR No. 604, in comparison with calomel and CuSO_4 . The results were especially promising for lima and snap beans, beets, chard, cucumbers, lettuce, peas, spinach, squash, tomatoes, and corn.

Seedling blight of asparagus, C. M. HAENSELER (*New Jersey Stas. Plant Disease Notes*, 23 (1946), No. 2, pp. 5-8).—For many years a blight of asparagus seedlings 2 to 4 in. high has been observed in southern New Jersey; no very characteristic symptoms occurred other than that when about 1 to 4 in. high the seedlings turned yellow, then brown, and died. Various suggestions as to the cause have been followed through but none has appeared to fit the situation. More recently studies of the insect populations of blighted fields have revealed the presence of springtails feeding near the soil surface. Preliminary tests with insecticides in 1945 gave some evidence that these insects may be implicated.

Exploratory experiments with the big-vein disease of lettuce, D. E. PRYOR. (U. S. D. A.). (*Phytopathology*, 36 (1946), No. 4, pp. 264-272).—Tests with leaf-feeding aphids, mechanical inoculation, and seed soaked in leaf juice or harvested from diseased plants resulted in no consistent transmission of big vein. The unfiltered leachate from infective soil added to disease-free soil produced big vein in 4 of 83 plants; filtered leachate (medium Mandler filter) caused no disease. Big vein was not eliminated from infective soil by leaching. Symptoms appeared in plants grown on big vein-free soil to which chopped diseased leaves had been added. There was little difference in the amount of the disease developing in transplants to, vs. lettuce seeded directly in, infective soil. Trials in which one big vein plant was grown for 2 to 2.5 mo. adjacent to 3 healthy plants in a 6-in. pot filled with disease-free soil indicated that big vein spreads very slowly if at all through undisturbed soil during the experimental period used. There was a slight tendency for fewer diseased plants to appear in undrained pots filled with Imperial Valley soil than in drained pots, but in only one test was this difference statistically significant. Transplanting at intervals from infective to noninfective soils indicated that some infection occurs within 2 weeks from seeding, but at least 4 weeks were required for a large proportion of the plants to become infected. Diluting 1 part of big vein soil with 800 parts of autoclaved soil reduced the disease incidence only slightly. Stored air-dry soil remained infective for at least 8 yr. Under favorable air temperature, the optimum soil temperature for development of big vein appeared to be about 22° C., with some infection occurring at all soil temperatures from 14° to 30°. Air temperature also seemed to have some effect on symptom expression.

Tipburn of lettuce—effect of maturity, air and soil temperature, and soil moisture tension, E. M. ANDERSEN ([*New York*] *Cornell Sta. Bul.* 829 (1946), pp. 14, illus. 13).—Water deficiency, as indicated by high soil water tension, was shown to be the primary cause of the physiological break-down under study; the findings are in line with published work of certain other investigators (22 references). Low

soil temperatures increased the tipburn, probably by further decreasing the availability of soil moisture. In these experiments, there was a high correlation between severity and the difference between maxima of air and soil temperatures; tipburn was most severe when this difference was greatest. The largest difference between air and soil temperatures occurred when a cool moist period was followed by a sunny dry period. It is believed that under such conditions water intake is too low to replace water loss, and that the resulting water deficiency results in tipburn. It is also possible that tipburn may result from some physiological disorder which accompanies a reduced moisture supply to succulent tissues rather than directly from the reduced moisture supply itself. If such be the case, tipburn might be induced by other environal conditions, thus accounting for the divergent views concerning its cause.

Relation of color-inhibiting factor to smudge resistance in onion, H. A. JONES, J. C. WALKER, T. M. LITTLE, and R. H. LARSON. (U. S. D. A. coop. Wis. Expt. Sta.). *Jour. Agr. Res.* [U. S.], 72 (1946), No. 7, pp. 259-264.—Seed of onions segregating for white, cream, and red or yellow bulb color were sown in flats and the seedlings later planted in the field at Madison, Wis.; when the bulbs were about half-grown, cultures of *Colletotrichum circinans* were distributed over the lower portion of the plants which, when mature, were cured in shallow crates. Readings during mid-November indicated the white bulbs homozygous for the dominant color inhibitor (*I*) were also highly susceptible to smudge; colored bulbs (red or yellow) with the genetic constitution *ii* were highly resistant; the cream-colored bulbs (*Ii*) were about intermediate in resistance between the white and colored. The most important factor in resistance to this fungus disease is clearly the presence of pigment in the dry outer scales of the bulbs. There are 15 references.

Influence of nitrogen nutrition on susceptibility of onions to yellow-dwarf virus, P. BRIERLEY and N. W. STUART. (U. S. D. A.). (*Phytopathology*, 36 (1946), No. 4, pp. 297-301, illus. 1).—Four varieties of onions grown at 60 and 6 p. p. m. weekly initial N levels in Haydite were inoculated with the onion yellow dwarf virus; both infection and symptom expression were less at the lower N level. The immunity of the Utah Sweet Spanish variety was unaffected by repeated inoculation at a high-N level that enhanced infection in the susceptible Ebenezer and in the resistant varieties. Creole and Stockton Yellow Globe exhibited a resistance to infection distinct from the immunity of Utah Sweet Spanish.

Reaction of onion varieties to yellow-dwarf virus and to three similar viruses isolated from shallot, garlic, and narcissus, P. BRIERLEY and F. F. SMITH. (U. S. D. A.). (*Phytopathology*, 36 (1946), No. 4, pp. 292-296).—Of 27 onion varieties mechanically inoculated with onion yellow dwarf virus and related isolates from shallot, garlic, and narcissus, 10 samples proved immune to yellow dwarf and also to the isolates from garlic and narcissus; 17 varieties proved susceptible to these 3 viruses. All but Nebuka (*Allium fistulosum*) and an amphidiploid (Nebuka × White Portugal) were susceptible to the shallot virus; these 2 green-branching types were found immune to all 4 viruses tested. All 4 viruses were transmitted by *Myzus persicae*.

Sweet corn seed treatments, B. H. DAVIS and C. M. HAENSELER (*New Jersey Stas. Plant Disease Notes*, 23 (1946), No. 1, pp. 4).—The conditions favorable to seed and seedling decay—and therefore for pronounced results from seed treatment—are briefly discussed. In a 1945 test with Semesan, Arasan, and Spergon, not only was there an increase in the actual number of plants from treated seed but also a decrease in the number of weaklings and a significant increase in the height of the plants—with no marked differences among the fungicides used. "From the use of seed protectants on sweet corn we may expect not only increased stands in about 60 percent of the cases but also more uniform stands and greater plant vigor."

Peach blotch, R. S. WILLISON (*Phytopathology*, 36 (1946), No. 4, pp. 273-276, *illus. 1*).—A graft-transmissible leaf variegation of peach varieties is reported from Ontario. The symptoms comprise pale green to yellowish-green areas ranging from numerous small angular spots to large single blotches arranged either centrally and symmetrically along the midrib or as a band around the leaf margin; some leaves have yellow markings along the veins, and affected leaves occasionally show marginal scorch and emargination. Flowers, fruits, and twigs have no apparent symptoms. This disease—referred to as peach blotch—was transmitted to peach but not to the plum, cherry, or apricot varieties used as differential hosts. The peach varieties Marigold, Elberta, and Rochester exhibited the characteristic markings; Vedette and Golden Jubilee were little affected. Blotch—observed in nature on only two trees in widely separated localities—is similar to but not identical with the peach mottle and calico of the western United States.

Mineral nutrient deficiencies in California citrus trees and their causes, P. W. ROHRBAUGH (*Calif. Citrog.*, 31 (1946), No. 6, pp. 201, 225-228, *illus. 2*).—This paper represents "an effort to compile and interpret published work, most of which originated in the experiment stations of California and Florida."

Some additional information on citrus psorosis, H. E. STEPHENS [STEVENS]. (U. S. D. A.). (*Citrus. Indus.*, 27 (1946), No. 3, pp. 8-9, 15-17, 20-21, *illus. 1*).—The author's previous discussion of the history, characteristics, nature, and cause of the disease and certain suggestions as to control—especially in nurseries—have been noted previously (E. S. R., 89, p. 232). "Several new facts and angles have been uncovered in recent studies which may be used to advantage in preventing the future spread of this disease"; these are here considered under bark and leaf symptoms, bud transmission, tests for parent trees, stock infection, effect of psorosis on yield, and control. Infected budwood is the principal source of spread; production of nursery trees free from the disease is the most logical and practical method of control.

Quick decline of orange trees, D. C. MILBRATH (*Citrus Leaves*, 26 (1946), No. 3, p. 36).—A brief note based on recent general and detailed observations in California.

A propos des pourritures des agrumes [Citrus fruit rots], G. VIENNOT-BOURGIN (*Fruits d'Outre Mer*, 1 (1946), No. 6, pp. 164-171, *illus. 6*).—On the penicillium rots of citrus and apple fruits—with special reference to those on the French markets—and their control. There are 41 literature references.

Transmission of papaya bunchy top by a leaf hopper of the genus Empoasca, J. ADSUAR. (P. R. Univ. Expt. Sta.). (*Science*, 103 (1946), No. 2671, p. 316).—The author found a species of *Empoasca* able to transmit the virus of papaya bunchy top; 71 out of 90 healthy trees exposed to these leafhoppers collected on diseased trees developed the symptoms, whereas the unexposed trees remained normal.

Undersökningar över vissnesjuka hos sommaraster *Callistephus chinensis* (L.) Nees (Investigations into the wilt of China aster (*C. chinensis* (L.) Nees), I. BERGSTRÖM-KIELLANDER ([Sweden] *Statens Växtskyddsanst. Meddel.* 42 (1944), pp. 78, *illus. 14*; *Eng. abs.*, pp. 64-75).—In this review (52 references) and general investigation, the author takes up the symptoms, cause, effects, and control of the disease, culture studies of fungi isolated from asters, and taxonomic considerations. It was experimentally revealed that in Sweden (like most other countries) the true wilt disease is the most serious obstacle to the successful production of asters in the field. The pathogen isolated was in all cases *Fusarium conglutinans callistephi*. The control measures investigated were soil and seed disinfection, crop rotation, and use of resistant varieties; the last method is recommended as best.

Undersökningar över "blad- och grentorka" hos importerade azaleor (Investigations into "leaf and twig blight" in imported azaleas), D. LIHNELL ([Sweden]

Statens Värtskyddsanst. Meddel. 40 (1943), pp. 74, illus. 17; Eng. abs., pp. 63-73.—The author reports a twig and leaf blight of azaleas imported chiefly from Belgium for forcing in Sweden during the winter months. The chief symptom consists of an abnormally copious dropping of the leaves beginning with the lowermost and progressing upward; the detachment of the leaves is the primary phenomenon, the "blight" being secondary. Various degrees of injury are encountered up to death of most of the branches and production of only a few flowers. Normally the transportation period covers 1 to 2 and latterly 3 to 5 weeks in more or less closed spaces without access to light and with very little air; the period during which they are packaged is probably much longer. As a general result of the experimental work it is considered that the trouble is nonparasitic in origin, the evidence at hand leading to the belief that the chief cause lies in CO₂ poisoning during the period of packaging. There are 28 references.

Forcing lily bulbs after treatment for control of nematodes, W. D. COURTNEY and E. P. BREakey. (U. S. D. A. and Wash. Expt. Sta.). (*Florists' Rev.*, 96 (1945), No. 2496, pp. 37-38).—Hot-water-formalin treatment of nematode-infested Croft lily bulbs resulted in earlier emergence of the plants, a larger total number of buds, and an increased number of early blooms; the treated plants were also significantly taller than the controls. There was no essential difference in the number of plants finally coming up, nor did dipping or curing for 2 to 16 days change the picture. The number of blind plants was greatly reduced in the treated plants, although its complete elimination was not effected. Dieback was completely done away with, except for one apparently recontaminated plant. The number of bunchy plants was greatly reduced, though not fully controlled. Since the experimental lots were forced under typical commercial conditions, there appears to be little danger of serious nematode loss through contamination in the forcing period; this observation does not apply to propagation stocks. Blooms, buds, and foliage exhibited no injury from the treatment.

Failure of bud and graft unions of rose induced by *Chalaropsis thielavioides*, K. F. BAKER and H. EARL THOMAS. (Univ. Calif.). (*Phytopathology*, 36 (1946), No. 4, pp. 281-291, illus. 2).—The black mold *C. thielavioides* caused bud unions in three central California rose fields (1940) and grafts in one greenhouse (1945) to fail; this trouble has not been found in southern California where roses are largely grown on immune ragged-robin rootstocks. Infected buds and cut surfaces of scion or stock become blackened and union is prevented. *Rosa odorata* and *R. chinensis manetti* understocks proved very susceptible, *R. multiflora* moderately so, and ragged-robin and *R. laxa* immune. The immunity factor of ragged-robin is restricted to living cells and can be decreased by moderate heat treatments. The rose form of the fungus was found pathogenic to numerous other roses and woody plants, but the lupine, walnut, and Chinese elm forms proved nonpathogenic to roses. The fungus is disseminated by infected plant parts, irrigation water, spattering water drops, soil, and workmen; it survives nearly a year in soil or buried plant parts. A bait method for determining the presence of the fungus is described. Infection occurs only through wounds, and the fungus is aggressive only on dormant plant parts. Graft failures could best be avoided by use of budded roses, fungus-free rootstocks, sanitation, and chemical treatment of stems before grafting. Bud failures can be prevented by immediate planting of the cuttings or storing them at 0° C., rotation with immune crops, use of immune rootstocks, high budding into canes later made into cuttings, and by precaution against transfer of infection by workmen. Preventive chemical treatments of cut surfaces proved unsuccessful because of host injury.

"Root nodules" on zinnia produced by nematodes, K. L. JONES (*Mich. Acad. Sci., Arts, and Letters, Papers*, 30 (1944), pp. 67-70, illus. 2).—Healthy appearing zinnia plants from one garden were found to possess root galls apparently induced

by nematodes; their tunnels and the cells lining them were practically filled with one saprophytic bacterium—the slime-producing *Alcaligenes radiobacter*.

Fusiform rust, a threat to slash pine plantations, P. V. SIGGERS (*Miss. Farm Res. [Mississippi Sta.]*, 9 (1946), No. 1, pp. 1, 7, illus. 1).—Though slash pine is relatively free from needle disease and insect pests, *Cronartium fusiforme* infection is said to damage these and associated species seriously. Loblolly and slash pines are highly susceptible, whereas longleaf pine is more resistant; the rust has never been found on shortleaf pine in Mississippi. Species of oak likewise differ, water, willow, and laurel oaks being highly susceptible; others listed in the descending order of susceptibility are blackjack, bluejack, southern red, turkey, and live oaks. As a group, the white oaks may be disregarded as carriers, infection on them being very slight; the oaks usually suffer but little damage from this rust. Preventive measures are summarized. In general, the greater the number of cankered trees in natural stands, the higher will be the risk in establishing slash plantations. Practices hastening the growth of slash pine increase the susceptibility. Since direct measures of control are usually impractical, more reliance could well be placed on longleaf and shortleaf pines. Provided intensive measures are possible, early pruning of branch cankers will aid in reducing the spread.

ECONOMIC ZOOLOGY—ENTOMOLOGY

An ecological reconnaissance in the Medicine Bow Mountains, I. H. BLAKE (*Univ. Nebr.*). (*Ecol. Monog.*, 15 (1945), No. 3, pp. 207–242, illus. 6).—This paper is offered as an introduction to some of the animal communities of these mountains of southern Wyoming; it is presented in the hope that it will prove a useful tool for those carrying on more detailed studies of the animal communities of the area, as well as of those found in ecologically similar localities of the Rock Mountain region in general. There are 33 references.

The annual cycle of plants, mosquitoes, birds, and mammals in two Brazilian forests, D. E. DAVIS (*Ecol. Monog.*, 15 (1945), No. 3, pp. 243–295, illus. 24).—In many parts of South America yellow fever is contracted in the forests of the jungles; the jungle form of the virus is presumably transmitted to the vertebrate hosts by forest-inhabiting arthropods, human infection appearing to be adventitious and seeming to play no essential role in the life history of the virus. The investigations here described in detail comprise part of a program undertaken to learn more about the lives of forest animals, with a view to finding out what species may fit the role of hosts and vectors of the jungle yellow fever virus.

La protection des cultures sauve des millions [Crop protection saves millions] (*Zurich: Off. Suisse Propagande pour les Produits de l'Agr. Suisse*, 1944, pp. 112, over 200 illus.).—A handbook of diseases and pests of cultivated plants and their control, including useful animals and insects. There are six colored plates.

Mammals from Welaka, Putnam County, Florida, J. C. MOORE (*Jour. Mammal.*, 27 (1946), No. 1, pp. 49–59, illus. 1).—The information presented was acquired as a result of field work on the University of Florida Conservation Reserve at Welaka. A description of the area (with map) precedes the accounts of the species. There are 18 references.

An ecological study of the bighorn sheep in Rocky Mountain National Park, Colorado, F. M. PACKARD (*Jour. Mammal.*, 27 (1946), No. 1, pp. 3–28, illus. 2).—The objectives of this study were to determine the approximate number of bighorn sheep in the park, with their distribution and ranges; to obtain information on the history of the species in this area as an aid in evaluating the seriousness of the evident decline and the factors back of it; to investigate possible methods of counteracting or removing the causes; and to reach some conclusions on the probable future of

the species in the park. The advent of white settlers caused the initial decline, due to hunting, restrictions of the lower winter range, and the introduction of scabies. Adequate protection after 1909 resulted in a recrudescence. A second decline became evident in 1921 and has continued to the present; this was traced tentatively to an apparent deficiency of mineral salts in the granitic soils of the current ranges which may be accompanied by protein deficiencies as well. The effect appears to be a reduction in stamina, with an increased susceptibility to various parasites. The lack of yearlings suggests that mortality of the lambs is high. Placing mineralized salt blocks on the range is recommended. It is believed doubtful whether predators or competition by elk have been of any real significance in the decline. Two years' observations indicated that about 300 individuals occupied the park area during 1939-40; the sex ratio was about 2 ewes to 1 ram.

Rodent activity in a mixed prairie near Hays, Kansas, H. L. BROWN. (U. S. D. A.). (*Kans. Acad. Sci. Trans.*, 48 (1946), No. 4, pp. 448-456).—The white-footed mouse was found to utilize 24 species of plants, but feeding tests indicated that—when available—88 percent of its diet consisted of insects, with grasshoppers preferred. The harvest mouse secured food from 11 plant species; in feeding tests, about 63 percent of its diet was insects when available. The wood rat and pocket mouse occurred on the rocky hills; the spermophile preferred the short grass—or other types where the vegetation was closely grazed. The meadow mouse was found occasionally on areas dominated by midgrasses, especially wheatgrass; it was more common before the 1933-39 drought. The present estimate is about 3,232 white-footed mice and 1,766 harvest mice per square mile; baited traps increased the catches of the latter but not of the former. Gravid ♀♀ of the white-footed mouse were caught each month of the study during September-March. Seeds of smooth sumac and ill-scented sumac were taken from fecal pellets of the wood rat; many were viable, and in some cases germination was increased by animal passage. The spermophile and white-footed mouse disseminated seeds of cactus and buffalo grass by storing them in caches. Burning the grass on the natural revegetation area increased the catches of the white-footed mouse, but no harvest mice were caught after burning; examination showed that the mice had not been burned, but had migrated in or out of the area. The findings revealed that the white-footed and harvest mice are beneficial to the farmer in this region, since much of their diet is of destructive insects that feed on native and cultivated plants. Animal populations vary from year to year, depending on the ecological factors which benefit or deplete the vegetation supporting them.

Techniques for the study of the Norway rat (*Rattus norvegicus*), D. CHITTY and M. SHORTEN (*Jour. Mammal.*, 27 (1946), No. 1, pp. 63-78, illus. 10).—Surplus baiting with wheat has been used to census wild rat populations, especially before and after tests with poisons; for a proper interpretation of the data and also of the factors involved in poisoning, the feeding behavior of the rats must be understood. Automatic half-hourly records of wheat consumption have shown the predominantly nocturnal habit of well-fed rats—even in a quiet environment. Where food is inadequate, rats can often be conditioned to feed rapidly on token baits at any time of day, though occasionally this response is shown only at night. It is possible to watch the feeding habits, the behavior toward changes in environment or food, and other actions. There is sometimes a lengthy adjustment to certain kinds of change, but baited rats get used to artificial light and can then be watched at night. For short-term studies, individual rats can be marked by making numbers with a depilatory in their fur; then both the total population and the average individual consumption of bait can be determined. Though most rats in a colony become well baited, others show peculiarities such as indifference to bait or long absence after a single mouthful; this accounts for the survival of certain rats after poisoning.

Some helminth parasites of skunks in Texas, J. D. TINER. (Mich. State Col.). (*Jour. Mammal.*, 27 (1946), No. 1, pp. 82-83).—Six kinds of parasites are said to have been recovered from stomachs and intestines of about 170 skunks of 3 genera collected in Texas. So far as known, *Molineus* sp. has not previously been reported from these hosts; *Filaria martis* is reported for the first time from *Coneptus mesoleucus* and *Mephitis mephitis*; *Physaloptera maxillaris* has not been reported previously in *Spilogale leucoparia*.

The blackbird: A contribution to the study of a single avian species, A. F. C. HILLSTEAD (London: Faber & Faber, 1945, pp. 104, illus. 19).—This general contribution on the blackbird (*Turdus merula merula*) considers such matters as its song, territory, behavior, nesting, food, migration, and plumage.

Preliminary list of spiders of the Great Swamp, J. L. C. and W. F. RAPP, JR. (*Bul. Brooklyn Ent. Soc.*, 41 (1946), No. 1, pp. 4-5).—An annotated list of spiders taken by sweeping in the terrestrial grasslands on the southern face of the Wisconsin Terminal Moraine forming the northern boundary of the Great Swamp, Morris County, N. J.

Grasshoppers ovipositing in a pile of coal, H. C. SEVERIN (*Bul. Brooklyn Ent. Soc.*, 40 (1945), No. 5, pp. 159-160).

The Cercopidae or spittlebugs of Missouri, R. C. FROESCHNER (*Jour. Kans. Ent. Soc.*, 19 (1946), No. 1, pp. 30-35, illus. 4).—In addition to brief notes, the author presents keys to the Missouri subfamilies, genera, and species of the family Cercopidae.

The Mexican species of Idiodonus (Homoptera: Cicadellidae), D. M. DELONG. (Ohio State Univ.). (*Ohio Jour. Sci.*, 46 (1946), No. 1, pp. 13-30, illus. 3).—Some 35 species of this leafhopper genus are considered in this taxonomic study; 30 are described as new. A key for separating species or groups by color patterns is provided.

Erythroneura of the obliqua group from Ohio and Tennessee (Homoptera: Cicadellidae), D. J. KNULL. (Ohio State Univ. et al.). (*Ohio Jour. Sci.*, 46 (1946), No. 1, pp. 45-49, illus. 11).—Five new species of the leafhopper genus *Erythroneura* are described, with new records for Ohio, corrections, and synonymy included.

The photography of types of Lepidoptera, C. F. DOS PASSOS (*Bul. Brooklyn Ent. Soc.*, 40 (1945), No. 5, pp. 166-169, illus. 4).—The importance of photographing type specimens of Lepidoptera with the labels attached is considered by the author to be self-evident. The apparatus here described and illustrated is believed to obviate the difficulties of previous methods.

Synopsis of the cerambycid beetles of the genus Stenosphenus Haldeman found in America, north of Mexico, W. S. FISHER. (U. S. D. A.). (*Jour. Wash. Acad. Sci.*, 36 (1946), No. 3, pp. 86-94).—A key to the species is included.

Competition between two entomogenous bacteria, R. L. BEARD. (Conn. [New Haven] Expt. Sta.). (*Science*, 103 (1946), No. 2673, pp. 371-372).—A note on the possible antibiotic activity between *Bacillus popilliae* and *B. lentimorbus*, causes of two types of milky disease of Japanese beetles. Both types of parasitism do not occur in the same host individual. If a mixture of the two is used as inoculum only one form of the disease develops, the relative dosage largely determining which is successful.

Myrmecological technique.—I, The use of ether in collecting ants, C. H. KENNEDY. (Ohio State Univ.). (*Ohio Jour. Sci.*, 46 (1946), No. 1, pp. 10-12).

Ant hosts of the fungus Laboulbenia formicarum Thaxter, M. R. SMITH. (U. S. D. A.). (*Ent. Soc. Wash. Proc.*, 48 (1946), No. 2, pp. 29-31).—The parasitic ant fungus *L. formicarum* has been previously recorded in the United States from only a few forms of ants of the genera *Lasius* and *Formica*. Its discovery on eight new hosts—and especially on two more genera—seemed worthy of record; all the

ants known to be affected by this fungus are added to this list, along with pertinent comments. Contributions on the morphology, taxonomy, and biology of the fungus are given in the bibliography (10 references).

Notes on the behavior of a few solitary wasps, P. RAU (*Bul. Brooklyn Ent. Soc.*, 41 (1946), No. 1, pp. 10-11).—Miscellaneous field observations are presented.

On the penetration of insecticides through the insect cuticle, J. E. WEBB and R. A. GREEN (*Jour. Expt. Biol.*, 22 (1945), No. 1-2, pp. 8-20, illus. 2).—With the sheep tick as the test insect, the authors found that certain organic solvents (e. g., cresols, benzyl alcohol, 4-methyl-cyclohexanol) greatly increased the rate of action of diphenylamine; others (e. g., carbitol, methyl benzoate) gave little or no improvement in killing time. The degree to which a solvent induces rapid penetration of an insecticide is referred to as its "carrier efficiency." A high carrier efficiency was found to be correlated with a high rate of penetration through beeswax, a high partition coefficient of the solvent between beeswax and water, and a high solubility of insecticide in a water solution of the solvent; the volatility of the solvent and the solubility of the insecticide were also contributory factors. Mixtures of two solvents, each exhibiting no carrier efficiency but together possessing all the essential physical properties, revealed a carrier efficiency considerably higher than either alone; this is taken as supporting evidence that carrier efficiency depends on certain physical properties of the solvent. With a range of solvents having various degrees of carrier efficiency, comparable results were obtained in the use of dioxathion, ω -nitrostyrene dibromide, and rotenone, showing that the synergy could be extended to other insecticides. It is suggested that certain solvents increase the rate of penetration of contact insecticides through the insect cuticle by (1) transporting the insecticide through the lipid elements of the epicuticle to the interface between it and the water permeating the exocuticle, (2) concentrating the insecticide at the interface between epicuticle and exocuticle and thus increasing the diffusion gradient of the insecticide across that interface, and (3) increasing the solubility of the insecticide in the water permeating exo- and endocuticles and thus further increasing its rate of diffusion, not only across this interface but also through exo- and endocuticles to the hypodermis.

Review of United States patents relating to pest control [January-December 1945], R. C. ROARK (*U. S. Dept. Agr., Bur. Ent. and Plant Quar., Rev. U. S. Pat. Relat. Pest Control*, 18 (1945), Nos. 1, pp. 6; 2, pp. 6; 3, pp. 4; 4, pp. 4; 5, pp. 7; 6, pp. 3; 7, pp. 3; 8, pp. 6; 9, pp. 5; 10, pp. 4; 11, pp. 4; 12, pp. 5).—A continuation of this series (*E. S. R.*, 93, p. 600).

Quarterly bibliography of insecticide materials of vegetable origin, No. 32 (July to September 1945), R. M. JOHNSON (*Bul. Imp. Inst. [London]*, 43 (1945), No. 4, pp. 287-292).—A continuation of this bibliography (*E. S. R.*, 94, p. 638).

German insecticide evaluation, L. B. KILGORE (*Soap and Sanit. Chem.*, 22 (1946), No. 3, pp. 122-125, 173, illus. 3).—The preceding papers (*E. S. R.*, 95, p. 80) on synthetic insecticides in Germany indicated the nature and scope of the activity of the German chemists in this field over the years immediately prior to and during World War II; the present paper is concerned primarily with the methods they employed to evaluate the toxicity of their various chemicals toward insects and warm-blooded animals. These methods involved the testing of contact and oral poisons and of repellents and the pharmacological testing of insecticides.

Evaluating pyrethrum extract: A comparison of chemical and biological methods of evaluating concentrated extracts, W. F. BARTHEL, W. A. GERSDORFF, F. B. LAForge, and J. J. T. GRAHAM. (*U. S. D. A.*). (*Soap and Sanit. Chem.*, 22 (1946), No. 3, pp. 129, 131).—Chemical analysis of a sample of purified pyrethrum extract prepared by the nitromethane-charcoal process showed that the Seil method gives consistently lower results than either the Association of Official Agricultural

Chemists or the hydrogenation methods. Biological comparisons against houseflies of sprays prepared according to the A. O. A. C. evaluation indicated that the pyrethrum preparation underwent the purification process without loss of insecticidal activity and retained its full activity for 10 mo. when kept at 2° C.

Preliminary experiments with benzene hexachloride (666) as an insecticide, G. G. DUSTAN, T. ARMSTRONG, and W. L. PUTMAN (*Sci. Agr.*, 26 (1946), No. 3, pp. 106-121).—This paper presents the results of exploratory tests with small samples of 666 received during 1944-45 on the codling moth, oriental fruit moth, diamond-back moth, greenhouse leaf tier, strawberry leaf roller, asparagus beetle, spotted asparagus beetle, striped cucumber beetle, rose chafer, pear psylla, green chrysanthemum aphid (*Rhopalosiphum rufomaculatum* (Wilson)), squash bug, large milkweed bug, chrysanthemum thrips, European red mite, and common red spider mite (*Tetranychus telarius* (Linn.)).

D. D. T. as an agricultural insecticide, C. F. H. JENKINS (*Jour. Dept. Agr. West. Austral.*, 2. ser., 22 (1945), No. 3, pp. 229-232).—In the experiments described and tabulated, DDT did not kill all important plant insects, and many mites proved particularly resistant. It was very effective against caterpillars. Cabbage and cauliflower treated periodically with 1 percent DDT dust were practically free of all signs of chewing injury; tomato plants treated from seedling to maturity showed a marked reduction in number of "wormy" fruits, and green tomato bug infestation was greatly reduced. Other pests against which DDT was very satisfactory were the potato tuber worm, *Agrotis radians*, *Otiorrhynchus cribricollis*, and *Empoasca terra-reginae*. The indications were that leaf-eating orchard pests can be controlled with 0.1 percent DDT sprays, but tests against scale insects and aphids were inconclusive, and *Bryobia* mite appeared to be unaffected. Though toxic to many useful insects such as ladybirds, wasps, and bees, its use with discretion should minimize its bad effects and exploit its beneficial properties.

Compatibility of DDT with insecticides, fungicides, and fertilizers, E. E. FLECK and H. L. HALLER. (U. S. D. A.). (*Indus. and Engin. Chem.*, 37 (1945), No. 4, pp. 403-405).—Some of the more common insecticides, fungicides, and fertilizers were tested for catalytic action in the dehydrochlorination of DDT. Materials used for diluents were shown to vary in their activity as catalysts for the decomposition of DDT. The anhydrous chlorides of iron, aluminum, and chromium were active dehydrohalogenation catalysts for DDT. The catalytic action of anhydrous ferric chloride was found to be promoted by solution in naphthalene, chloronaphthalene, chlorobenzene, *o*- and *p*-dichlorobenzenes, and nitrobenzene, and inhibited by various hydrocarbon and fatty oils, alcohols, ketones, acids, and anhydrides.

Influence of DDT on yeast fermentation, M. I. TIMONIN (*Sci. Agr.*, 26 (1946), No. 3, pp. 122-129).—Media containing 5 to 20 mg. percent actual DDT gave a 1.96 percent reduction in total alcohol yield when that in control media was taken as 100; with less than 5 mg. percent DDT no reduction occurred. Alcohol production per gram of sugar consumed was not affected by adding to the medium up to 5 mg. percent of actual DDT; adding more than 5 and up to 21 mg. percent gave a 1.78 percent reduction when the yield in control media was expressed as 100. The intensity of fermentation in DDT-treated media was retarded during the first 5 days of incubation; this delay was largely compensated for later. Similar results, in general, have been obtained when grapes sprayed with DDT for control of insects were used in alcohol production. According to chemical analyses, no DDT was detected in the fermented grape juice obtained from DDT-sprayed grapes.

The excretion of DDT (2,2-bis-(*p*-chlorophenyl)-1,1,1-trichloroethane) in man, together with clinical observations, P. A. NEAL, T. R. SWEENEY, S. S. SPICER, and W. F. VON OETTINGEN (*Pub. Health Rpts. [U. S.]*, 61 (1946), No. 12, pp. 403-409, illus. 4).—The experiment described reveals that ingestion of 11 mg. per 1 kg. of body

weight of DDT dissolved in olive oil—corresponding to a total dose of 770 mg.—failed to cause detectable toxic effects in one normal individual. It was further shown that—as in rabbits—part of the DDT ingested was metabolized to di-(p-chlorophenyl)-acetic acid (DDA) and excreted with the urine. Under the test conditions, the maximum excretion of this metabolite occurred on the second day, decreasing rapidly on the third and fourth days, and diminishing gradually over the following 10 days.

The removal of DDT from water supplies, J. A. CAROLLO (*Jour. Amer. Water Works Assoc.*, 37 (1945), No. 12, pp. 1310-1317).—DDT applied to any water gradually loses its ability to kill the yellow-fever mosquito; 0.0015 p. p. m. became ineffective in 48 hr. and 0.1 p. p. m. in 10 to 12 days. Turbidity in the water had little effect on the 48-hr. kill of mosquito larvae by DDT, but on settling out removed some of the DDT held in suspension. The normal concentrations of DDT used in mosquito larvicide work did not induce toxic effects in warm-blooded animals drinking water so treated. Any of the conventional water treatment processes involving coagulation, sedimentation, and filtration removed 80 to 98 percent of DDT in a water supply originally containing 0.1 to 10 p. p. m. Complete removal (to less than 0.001 p. p. m.) of DDT from a water supply is said to be possible if intimate contact with activated carbon is provided for 15 min. after coagulation and sedimentation, but before filtration.

Alfalfa seed production in northern Saskatchewan as affected by lygus bugs, with a report on their control by burning, J. L. BOLTON and O. PECK (*Sci. Agr.*, 26 (1946), No. 3, pp. 130-137).—Populations of *Lygus* spp. have seriously affected the yields of alfalfa during certain years in this region. Fields producing the first seed crop tended to have lighter infestations than those grown later. A significant positive correlation was obtained between the number of these bugs in a field and the percentage of brown and shriveled seed taken before frost damage had occurred; this seed had a very low viability. The reduction in lygus populations found after burning of the stubble in early spring is believed to be due to the destruction of hibernated adults, of their food and shelter, and of their eggs on the new alfalfa growth; early spring burning is therefore offered as a practical control measure. Late spring burning is to be avoided, however, since it may seriously delay maturity of the crop.

Relation of temperature to the expression of resistance in wheats to hessian fly, W. B. CARTWRIGHT, R. M. CALDWELL, and L. E. COMPTON. (U. S. D. A. coop. Ind. Expt. Sta.). (*Jour. Amer. Soc. Agron.*, 38 (1946), No. 3, pp. 259-263).—The proportion of plants attacked and the intensity of infestation by the hessian fly were studied in seedlings of four resistant and two susceptible greenhouse-grown wheat varieties at ranges of 60° to 65° and 75° to 80° F. At the higher temperatures the percentages and intensities of infestation were significantly greater on the resistant spring wheat W38 and its resistant winter-type progeny B36162A13-12. The temperature effects were similar with the susceptible varieties B42 (spring type) and Wabash (winter type), but in each case the relative magnitude of the effect was much smaller than for the resistant varieties. It was impossible to determine from this work whether the effects of temperature on infestation were due to the response of the host alone or to a combined response of both host and insect. The near immunity of the durum P. I. 94587 was not reduced at the higher temperature; on the other hand, the resistance of a common wheat (42-chromosome) derivative of this durum was greatly affected by temperature. The immutability of the resistance of the durum P. I. 94587 at different temperatures is believed to indicate a fundamentally different resistance in that strain, as contrasted with the resistance of the common wheat varieties studied.

A new species of Keiferia on eggplant (Lepidoptera: Gelechiidae), C. HEINRICH. (U. S. D. A.). (*Ent. Soc. Wash. Proc.*, 48 (1946), No. 2, pp. 35-36, illus. 4).—

K. peniculo n. sp. is described, since it may have some importance as an enemy of eggplant; it was collected and reared from larvae on this host near a port of entry.

Soil nitrogen and thrips injury to spinach, S. H. WITTWER and L. HASEMAN. (Univ. Mo.). (*Science*, 103 (1946), No. 2672, pp. 331-332).—A note on the striking relationship shown between the amount of soil N provided for spinach plants and their resistance to attack by greenhouse thrips; as long as the plants made a luxuriant growth as a result of adequate N, they were practically immune to insect attack. Several points of interest in the interpretation of the findings are offered.

Apple blossom weevil and DDT, G. L. HEY (*Agriculture, Jour. Min. Agr. [Gi. Brit.]*, 52 (1946), No. 12, pp. 554-557).—Promising results are reported (1945) for one treatment with a spray containing 0.5 lb. DDT per 100 gal. applied at the breaking to bursting stages of the buds. A side issue was the excellent control of the apple capsid *Plesiocoris rugicollis* in two cases where DDT was applied at the breaking stage and again later.

Premiers essais de purification de la substance qui attire le doryphore vers les feuilles de pomme de terre [First attempts to purify the substance which attracts the Colorado potato beetle to potato leaves], R. CHAUVIN (*Compt. Rend. Acad. Sci. [Paris]*, 221 (1945), No. 23, pp. 713-714).—The attractant substance isolated and briefly described in this preliminary report is said to act like a glucoside—perhaps related to the flavones.

L'Attaque des tubercules de pommes de terre par les larves de doryphore [Potato tubers attacked by larvae of the Colorado potato beetle], M. DURCHON (*Compt. Rend. Acad. Sci. [Paris]*, 222 (1946), No. 4, p. 240).—A brief note.

Thigmotactisme et localisation sensorielle du contact dans l'enfouissement du doryphore adulte (*Leptinotarsa decemlineata* Say) [Thigmotaxis and sensory localization of contact in the burrowing of the Colorado potato beetle], P. GRISON (*Compt. Rend. Acad. Sci. [Paris]*, 222 (1946), No. 5, pp. 306-308).

Plum curculio control, A. M. WOODSIDE. (Va. Expt. Sta.). (*Va. Fruit*, 34 (1946), No. 3, pp. 18-19).—Recommended control measures are outlined. The dates of capture of the first curculio adults by jarring trees—with stages of tree growth at Crozet, Va.—are tabulated for each of 11 yr.

The use of DDT makes mite control necessary, A. M. WOODSIDE. (Va. Expt. Sta.). (*Va. Fruit*, 34 (1946), No. 3, pp. 14, 16, 18).—The development of mite infestations in the three instances reported illustrates the fact that these pests may become serious on apple trees where DDT is used unless material for their control is added. It has been found that mites can be kept under control by use of DN-111 or xanthone in alternate sprays.

DDT use in Tulare County, A. M. BOYCE and W. H. EWART. (Calif. Citrus Expt. Sta. et al.). (*Citrus Leaves*, 26 (1946), No. 3, p. 7).—Extensive experimental treatments have shown DDT to be effective against citrus thrips and citricola scale in central California, but much more information is needed as to its safety, proper formulations, dosages, and timing as well as on possible injuries to beneficial insects. Use of DDT in citrus orchards should thus still be considered experimental; certain suggestions for such use on the basis of present knowledge are given.

Biological control of prickly pear, F. W. PETTEY (*Farming in So. Africa*, 21 (1946), No. 238, pp. 31-33).—A brief progress report on the mass production and liberation of *Cactoblastis cactorum*, of the cochineal insect *Dactylopius opuntiae*, and of the boring beetle *Lagochirus funestus*, on what these insects have accomplished, and on investigations of the factors hampering their progress in the veld.

Factors affecting recovery from diapause and hatching of eggs of the forest tent caterpillar, *Malacosoma disstria* Hbn., A. C. HOBSON and C. J. WEINMAN (*Minnesota Sta. Tech. Bul.* 170 (1945), pp. 31, illus. 6).—According to studies on the influence of temperature on the termination of an embryonic diapause of the forest

tent caterpillar, diapause lasted for about 3 mo. after embryonic development was completed. Hatching response after exposures to temperatures ranging from 25° to -5° C. indicated diapause could be broken only after conditioning at below 20° to 25° for a sufficient length of time, and that optimum conditions prevailed near freezing. Histological studies of embryos treated similarly showed the fore- and mid-gut were packed with yolk during diapause, and that nearly complete absorption of the yolk was necessary before hatching took place. Histological changes associated with yolk absorption were compared with hatching data and it became evident that temperature had little influence on diapause, but temperature influenced the course of development after the diapause was broken. Differential hatching after exposure to both high and low temperatures was thought to have been caused by some injury from high temperatures or desiccation, or by a beneficial effect of low temperature during a critical period. Through a range of favorable temperatures the optimum moisture conditions were between relative humidities of 70 and 100 percent. The secretion which covered the eggs' "spumaline" is hygroscopic, absorbs considerable moisture from atmospheres of high relative humidities, and prevents rapid desiccation of eggs in dry air. In soaking experiments temperatures at which eggs were soaked were more important than length of submergence. Parasites were less affected by soaking than embryos. Embryos and parasites were able to adjust themselves to a reduced oxygen supply or to an accumulation of CO₂.

Eggs of the forest tent caterpillar are not very resistant to drying, and the hatching percentage was reduced considerably after 8 days drying over calcium chloride at 23° to 26° C. None hatched after 32 days of desiccation. On the other hand, egg parasites were quite resistant to desiccation.

Budworm control in jack pine by forest management, A. C. HODSON and P. J. ZEHNGRAFF. (Minn. Expt. Sta.). (*Jour. Forestry*, 44 (1946), No. 3, pp. 198-200).—Conclusive evidence is presented that outbreaks of the jack pine budworm (considered a distinct subspecies of *Archips fumiferana* (Clem.) if not a separate species) are closely correlated with an abundance of staminate flowers. New data are presented on the relation between classes of trees and staminate flower production in the light of which prompt removal of trees of poor or declining vigor is recommended. When it is considered that the suppressed and other trees of poor vigor bear the bulk of staminate flowers, that these are an essential part of the budworm diet, and that a small population of budworms is always present in trees producing staminate flowers, the benefit from removal of such trees seems obvious. The increase in yields attributed to thinnings is derived not only from accelerated increment on the residual stand, but also from the salvage of those trees which would not survive to the next cutting. Such trees should never be regarded as future crop trees in any commercial or noncommercial thinning.

Erechthias fulguritella Walk. (Lepidoptera) inhabiting pine cones, E. S. GOURLAY (*New Zeal. Jour. Sci. and Technol.*, 27 (1945), No. 3, Sect. B, pp. 248-250, illus. 2).—This native moth of New Zealand is recorded as associated with cones of *Pinus radiata*; its larvae invariably destroy the seed in infested cones but at present are said to have a negligible effect on seed production.

The influence of temperature, humidity, and density on the oviposition of the small strain of *Calandra oryzae* L. and *Rhizopertha dominica* Fab. (Coleoptera), L. C. BIRCH (*Austral. Jour. Expt. Biol. and Med. Sci.*, 23 (1945), No. 3, pp. 197-203, illus. 2).—The oviposition rate and total number of eggs laid by the rice weevil (small strain) and lesser grain borer were determined at different temperatures and densities and in grain differing in moisture content. An interaction between temperature, density, and time was found in their effects on the oviposition rate of the rice weevil; the proportional effect of density differed with temperature and age of insect, and the effect of different temperatures also varied with age of insect. The maximum

oviposition rate of this weevil was attained at the age of 1 to 2 weeks, depending on temperature; the average length of life of the ♀ was 3 mo. and of the ♂ 2 mo. At a density of 1 insect per 10 grains, the oviposition rates of the rice weevil at 25.5° and 29.1° C. were significantly greater than that at 23°, but did not differ significantly from each other over most of the insect's life; a higher maximum rate and total was reached at 29.1°. At a density of 1 in 50, a higher rate was reached over most of the insect's life at 25.5° and the total was greatest at this temperature. The main effect of reduced density of insects per grain was to increase the oviposition rate after the first 8 weeks; the effect was greatest at 25.5°, when the largest number of eggs was also laid (384). The oviposition rate and total eggs laid were less at 32° than at 29.1°; at 35° only 5 eggs per ♀ were laid; at 15.2° only 1 egg per week was laid, and at 13°, none. The lowest moisture content of wheat at which eggs were laid by the rice weevil was 10 percent; none was laid at 9.5°. Fewer eggs were laid at 12 percent than at 14; the number differed but little between 11 and 12 percent moisture content. Eggs of the lesser grain borer were not laid at temperatures higher than 39°; the rate at 18.3° was slow—only 38 eggs in 4 mo. The maximum number of eggs (415) was laid at 34° in grain of 14 percent moisture content. The rate did not fall off markedly in dry wheat until the moisture content was below 9 percent; 8 percent was the driest wheat in which eggs were laid.

The site of action of DDT in the cockroach. K. D. ROEDER and E. A. WEIANT (*Science*, 103 (1946), No. 2671, pp. 304–306).—The authors conclude from experimental evidence that although DDT undoubtedly affects motor nerves and muscle fibers at concentrations greater than 1,000 p. p. m., this action cannot be directly responsible for the clonic tremors in DDT-poisoned cockroaches which can be produced by internal concentrations of the order of 5 p. p. m.; DDT has no significant action on the cockroach central nervous system; its emulsion perfused through the leg of the cockroach in concentrations as low as 0.01 p. p. m. causes the appearance of a series of high frequency trains of axon spikes in the afferent fibers; and the tremors characteristic of DDT poisoning are due to an intense afferent bombardment of the motor neurons.

Effect of temperature on knock-down and kill of mosquitoes and bedbugs exposed to DDT. A. W. LINDQUIST, A. H. MADDEN, and H. O. SCHROEDER. (U. S. D. A.). (*Jour. Kans. Ent. Soc.*, 19 (1946), No. 1, pp. 13–15).—Following the experiments on houseflies (*E. S. R.*, 93, p. 748), additional tests were carried out on the common malaria and southern house mosquitoes and on two species of bedbugs; the results are reported briefly.

Two new species of *Aedes* (Finlaya) from New Guinea (Diptera: Culicidae). W. V. KING and H. HOOGSTRAAL (*Ent. Soc. Wash. Proc.*, 48 (1946), No. 2, pp. 37–38).

Experiments upon the feeding of *Aedes aegypti* through animal membranes with a view to applying this method to the chemotherapy of malaria. A. BISHOP and B. M. GILCHRIST (*Parasitology*, 37 (1946), No. 1–2, pp. 85–100, illus. 2).—In these experiments with the yellow-fever mosquito, *Plasmodium gallinaceum* was used as the malaria organism. Under suitable conditions the proportion of ♀♀ which gorge through membranes—though more variable than when a living chick was offered—proved great enough for experimental purposes. The gorging reaction was provoked by a heat gradient between environment and food-limiting membrane. Whole blood and red cells in saline, when ingested through membranes, went directly to the stomach which became fully distended; hemoglobin in plasma or distilled water was ingested to a lesser degree than whole blood or red cells in saline, and plasma alone was rarely ingested, but all these passed to the stomach; sweet solutions containing glucose or honey were seldom imbibed through membranes and passed to the stomach or diverticula, but only the latter were fully

distended. Offered as open drops, blood was seldom ingested but when taken in went to the stomach; hemoglobin in plasma or water, or plasma alone, were rarely ingested, but passed mainly to the stomach; sweet solutions (honey or glucose) or mixtures of blood and honey were readily ingested and passed mainly to the diverticula, which became fully distended, though traces might be found in the stomach. The yellow-fever mosquito may be infected satisfactorily with *P. galinaceum* by allowing engorgement on drawn infected chicken blood through a membrane. When infected mosquitoes were allowed to gorge on uninfected blood through membranes they ejected viable sporozoites into the blood. When young chicks were intravenously infected with this blood, infections were produced which in incubation period and intensity were comparable to those resulting from the direct bites of infected mosquitoes. The ejection of sporozoites through membranes in this manner provides a ready means of obtaining sporozoites free from glandular tissue. Those collected by this method should prove suitable for in vitro experiments on the action of drugs and also as a source of material for tissue-culture studies of the developmental stages of the malaria parasite arising directly from the sporozoite. There are 25 references.

Studies on imported malarias.—II, Ability of California anophelines to transmit malarias of foreign origin and other considerations, J. A. MOORE, M. D. YOUNG, N. H. HARDMAN, and T. H. STUBBS (*Jour. Natl. Malaria Soc.*, 4 (1945), No. 4, pp. 307-329).—It is believed justifiable to conclude from the detailed continuation of experimental results here reported (E. S. R., 93, p. 749) that control measures are necessary for the foreign malarias brought to the American west coast by relapsing carriers. In a comparison of the infectivity of foreign malarias to the California mosquitoes (*Anopheles maculipennis freeborni* Ait., *A. maculipennis occidentalis* D. & K., *A. punctipennis* (Say), and *A. pseudopunctipennis franciscanus* (McCrack.)), all appeared to have about the same susceptibility and all developed sporozoites. Transmission was tried and successful with the first three.

Note on Bironella (Brugella) hollandi Taylor, L. J. DUMBLETON (*New Zeal. Jour. Sci. and Technol.*, 27 (1945), No. 3, Sect. B, pp. 250-253, illus. 1).—The known distribution of this anopheline mosquito in the Solomon Islands is given, along with some information on its biology and a description of the egg.

Description of Chagasia rozeboomi, an anopheline from Ceará, Brazil, O. R. CAUSEY and L. M. and M. P. DEANE (*Jour. Natl. Malaria Soc.*, 4 (1945), No. 4, pp. 341-350, illus. 24).—This new anopheline mosquito from Brazil was first recorded from the eggs. The description and illustration of all stages of its life cycle and a table of differential characters for identification of the four known species of the genus are here presented.

Studies on mosquitoes of the genus Haemagogus in Colombia (Diptera: Culicidae), H. W. KUMM, E. OSORNO-MESA, and J. BOSHELL-MANRIQUE (*Amer. Jour. Hyg.*, 43 (1946), No. 1, pp. 13-28, illus. 7).—Eight species of *Haemagogus* were found in Colombia—seven in the lowlands and one in the highlands. The commonest and most widely distributed species is *H. spegazzinii falco* (illustrated in color), which has been incriminated as a vector of jungle yellow fever. Keys and diagrams are given for separating the larvae, adults, and ♂ terminalia of the genus as it occurs in Colombia.

Phoniomyia hirsuta, a new sabethine from Jamaica (Diptera: Culicidae), R. B. and C. M. HILL (*Ent. Soc. Wash. Proc.*, 48 (1946), No. 2, pp. 39-41, illus. 5).—The ♀, ♂, pupa, and larva of this new mosquito are described.

An investigation on new repellents for the protection of man against mosquito attacks, D. BLAGOVESHCHENSKY, N. BREGETOVA and A. MONCHADSKY (*Roy. Soc. Trop. Med. and Hyg., Trans.*, 39 (1945), No. 2, pp. 147-150).—According to the authors, it has "been demonstrated that the d- α -pinene fraction of juniper oil is a

very effective repellent substance. It can be employed both in its pure form or as a substitute for turpentine."

DDT against house flies: The comparative toxicity to houseflies of *p,p'* DDT, *o,p'* DDT, and pyrethrum extract, W. A. GERSDORFF. (U. S. D. A.). (*Soap and Sanit. Chem.*, 22 (1946), No. 3, pp. 126-127, illus. 1).—The experimental data given show that, when estimated by comparison of the concentrations causing a 50-percent kill, *p,p'*-DDT was 53 times as toxic as *o,p'*-DDT. This ratio did not differ greatly throughout the course of toxic action, being 44 at the 10-percent mortality level and 60 at the 90-percent level. When these two compounds were compared with the pyrethrum extract, the variation of the ratio with change of mortality level was relatively greater, the ratio ranging from 1.7 to 4.4 for *p,p'*-DDT and from 0.038 to 0.073 for *o,p'*-DDT. The knock-down effect of *o,p'*-DDT in 25 min. was very similar to that of the *p,p'*-DDT, both of which were much less effective than the pyrethrum extract.

The fleas of Puerto Rico (Las pulgas en Puerto Rico), J. MALDONADO CAPRILES (*Puerto Rico Jour. Pub. Health and Trop. Med.*, 21 (1945), No. 2, pp. 173-183, illus. 8; *Span. pp.* 184-192).—The main purpose of this paper is to aid workers in prompt and correct identification of the seven flea species thus far recorded in Puerto Rico; included also is the widely distributed rat flea, though it has not yet been reported on the island. A simple key with drawings showing the important taxonomic characters of the eight species is provided, and the relations of these fleas to disease and to the rat fauna of the island are briefly discussed.

Notes on *Trombicula deliensis* Walch, 1923 (Acarina: Trombididae), with description of the adult, C. D. RADFORD (*Parasitology*, 37 (1946), No. 1-2, pp. 42-45, illus. 9).—Notes on the life history and description of this mite, larvae of which were obtained from a number of small mammals and birds.

The water balance in *Ixodes ricinus* L. and certain other species of ticks, A. D. LEES (*Parasitology*, 37 (1946), No. 1-2, pp. 1-20, illus. 8).—Unfed ticks gain water from humid air or water in contact with the cuticle and lose water by evaporation. While attached to the host they gain water from ingested blood and lose it in their excrement; the engorged tick usually lacks the ability to take up water from humid air. Water exchange occurs mainly through the cuticle; regulation of the water balance is thus brought about by the activity of the epidermal cells. The cuticle comprises two principal layers—the endocuticle and the epicuticle; the latter is overlaid by a lipid possessing important waterproofing properties. The pore canals—which traverse the endocuticle—are occupied by cytoplasm and may be important in the active transfer of water through the cuticle; they do not penetrate the epicuticle. Water loss from the unfed tick is not closely related to saturation deficiency, particularly at high humidity; this departure is due to the ability to secrete water. Such a state of equilibrium is attained at about 92 percent relative humidity; at lower humidities the tick loses water by evaporation, whereas at higher humidities it takes up water. Water retention at humidities below the point of equilibrium is due to both physical and secretory properties of the epicuticle; near this point, the loss or gain over a wide temperature range is determined by the relative humidity. Water uptake from humid air occurs when the tick is desiccated but ceases as the normal water content is restored. After previous exposure to saturated air the adapted tick at first loses water at relative humidities above the point of equilibrium, but later comes to retain water completely. Both unfed and engorged ticks can prevent or limit temporarily the entry of water in contact with the cuticle. The nine species examined differed considerably in their powers of limiting evaporation; this may reflect differences in the nature of the epicuticular lipid. The order of their resistance was as follows: *Ornithodoros moubata*, *Dermacentor andersoni*, *D. reticulatus*, *Rhipicephalus sanguineus*, *Amblyomma cajennense*, *A. maculatum*,

I. canisuga, *I. hexagonus*, and *I. ricinus*. The more resistant species also take up water through the cuticle after desiccation; indeed, the rate over a unit area of cuticle was approximately the same in all species of Ixodidae. Uptake of water thus appears to be limited by the ability of the epidermal cells to secrete water. There are 29 references.

The ecology of the sheep tick, *Ixodes ricinus* L.: Distribution of the tick on hill pasture. A. MILNE (*Parasitology*, 37 (1946), No. 1-2, pp. 75-81, illus. 2).—Further details (E. S. R., 91, p. 574) are given of the distribution of the castor-bean tick on the pastures of a typical hill farm in England. Sheep paths and their borders had tick populations similar in density to those of the general pasture; the night resting places, significantly lower nymphal densities than the general pasture. With ♂♂ and ♀♀ the difference was in the same direction, but it was less marked. On the typical hill, the vegetation layer becomes thinner and the nymphal density decreases with altitude; the case was not quite so clear with adult ♂♂ and ♀♀. Provided the vegetation was suitable—i. e., sufficiently thick—altitude had no limiting effect on nymphal distribution density within the levels observed. Tick density distribution is thus a function of vegetation conditions, the latter being influenced by altitude. The distribution of ticks on apparently uniform areas of vegetation was studied, and the sampling methods are discussed. Probably no more than an average of 12 nymphs per square yard are present in heavily infested pasture. The numbers per 100 sq. yd. differed significantly; the approximate numbers per acre also differed significantly in rather more than half of the observed cases. Larger area units within uniform stretches of pasture probably carry similar numbers of ticks. The practical applications of the findings to tick control are indicated.

The biology of *Ornithodoros delanoei acinus* Whittick, 1938. G. G. ROBINSON (*Parasitology*, 37 (1946), No. 1-2, pp. 82-84).—The life history of this tick was studied under laboratory conditions at 30° C.; it is here presented and summarized in tabular form.

Nairobi sheep disease: The survival of the virus in the tick *Rhipicephalus appendiculatus*. E. A. LEWIS (*Parasitology*, 37 (1946), No. 1-2, pp. 55-59, illus. 6).—It is clear from the experiments described that the virus will survive in this tick up to at least 871 days. The period for which infested land may remain dangerous for susceptible sheep is therefore longer than the 18 months' freedom from sheep and goats formerly recommended by another worker. "Indeed, it appears that the virus of Nairobi sheep disease, once it is introduced into an area where *R. appendiculatus* exists, will persist so long as unfed infected ticks remain on the land."

***Rhipicephalus neavei* Warburton, 1912, as a vector of East Coast fever.** E. A. LEWIS, S. E. PIERCY and A. J. WILEY (*Parasitology*, 37 (1946), No. 1-2, pp. 60-64, illus. 4).—From the preliminary experimental studies reported, it is concluded that *R. neavei* probably can—under favorable conditions in the field—maintain and spread East Coast fever in cattle, either in the presence or absence of the usual vector, *R. appendiculatus*.

Lipids in the central nervous system of the honey bee. E. K. PATTERSON, M. E. DUMM, and A. G. RICHARDS, JR. (*Arch. Biochem.*, 7 (1945), No. 1, pp. 201-210).—"Lipids were extracted and analyzed from the head portion of the central nervous system of approximately 1,300 honeybees. Standard micromethods were used to determine sterols, glycerol, fatty acids, phosphorus, choline, sphingomyelina, and sugars. Nitrogen determinations were carried out on the residue. Values for neutral fat, total phospholipids, and proteins were calculated. No evidence was found for the presence of cerebrosides. The data are compared with data from various vertebrates. It is concluded that the lipids of the insect nervous system are, in general, roughly comparable to those from the brains of young vertebrates prior to the appearance of visible medullation."

ANIMAL PRODUCTION

Digestibility of Kobe lespedeza hay (*Dairy Res. Digest [Louisiana Sta.]*, 4 (1946), No. 1, pp. 1, 4).—Studies of the comparative digestibility of Kobe lespedeza hay cut at different stages of maturity showed that it is more economical to cut hay early to insure higher percentages of protein and total digestible nutrients.

High protein content makes winter fat valuable forage for Colorado ranges, C. H. WASSER (*Colo. Farm Bul. [Colorado Sta.]*, 7 (1945), No. 5, pp. 6-7, 13, illus. 1).—Winter fat, a white sage, was shown on monthly analyses to have a high protein content which ranged from 8.12 percent in November to 18.59 percent in May. This was compared with buffalo grass, which had 4.36 percent in November to 9.45 percent in June, and western wheatgrass, which had 2.47 percent in February and 11.60 percent in May.

Nutritive value of distillers' dried solubles as a source of protein, C. W. HUGHES and S. M. HAUGE. (*Ind. Expt. Sta.*). (*Jour. Nutr.*, 30 (1945), No. 4, pp. 245-258).—Study was made of the nutritive value of dried brewers' yeast and various combinations of yeast and solubles for determining the value of yeast in the fortification of solubles. Yeast was of greater nutritive value than dried solubles as the sole source of protein and effectively supplemented solubles, corn, and combinations of these products. Biological tests with rats showed that distillers' dried solubles were inadequate as the sole source of protein and as a protein supplement because of deficiencies in lysine and tryptophan. Chemical studies revealed that solubles contain considerably less lysine and tryptophan than yeast. In vitro digestion experiments with proteolytic enzymes indicated that these amino acids are less available in solubles than in yeast. A small amount of yeast definitely increased the nutritive value of dried solubles, and the production of dried solubles with a higher yeast content would seem desirable.

Carotene loss in stored leaf meals and extracts, M. E. WALL and E. G. KELLEY. (U. S. D. A.). (*Indus. and Engin. Chem.*, 38 (1946), No. 2, pp. 215-218, illus. 5).—Carotene retention in vegetable leaf meals was found to depend primarily on the storage temperature. Of the three temperatures used in these tests (5°, 24°, and 37.5° C.), the greatest carotene stability was at 5° and the least at 37.5°. Retention varied with the species of leaf, and a high oxalic acid content of the leaf seemed to be favorable. Carotene concentrates from leaf meals dissolved in oils were more stable than crystalline carotene in the same oils, possibly owing to the tocopherol in the concentrate. Levels of carotene up to 1,000 µg. per gram were more stable than the 5,000- and 15,000-µg. levels. Oil solutions of carotene, of whatever source and at any concentration, were in most cases more stable at 5° than at higher temperatures. Addition of *d*-isoascorbyl palmitate and soybean lecithin to the carotene solution was ineffective in reducing loss of carotene.

The utilization of simple compounds of nitrogen by ruminants, W. D. GALLUP. (*Okla. Expt. Sta.*). (*Okla. Acad. Sci. Proc.*, 25 (1945), pp. 54-55).—In recent steer-feeding experiments, "urea has been fed by itself and in combination with hominy and molasses as a supplement to prairie hay. The apparent digestibility of the ration nutrients and the amount of nitrogen (protein) stored by the animals were determined during 10-day periods. The average value for nitrogen storage was negative, -14.4 gm. per day, when hay was fed alone and -0.8 gm. when urea was fed as a supplement at the rate of 89.4 gm. per day. In some instances nitrogen balances were positive during urea feeding. There was practically no change in the digestibility of hay constituents when urea was fed, consequently it appears that this improvement in nitrogen balance resulted from utilization of urea nitrogen, either directly or through the interaction of rumen organisms. There is the possibility, however, that the nitrogen of the hay was utilized in metabolism more efficiently

when urea formed a part of the ration. When approximately 89.4 gm. of urea were fed daily in combination with carbohydrates (hominy feed and molasses) nitrogen storage was further increased to about +3.4 gm. per day. However, the addition of this combination of urea and carbohydrates increased the digestibility of dry matter and crude fiber of the hay. It is possible, therefore, that when this supplement was fed a part of the observed increase in nitrogen storage resulted from increased digestion of nitrogen from the hay."

Studies on the carotenoid and vitamin A levels in cattle, I, II, W. BRAUN. (Univ. Calif. and U. S. D. A.). (*Jour. Nutr.*, 29 (1945), No. 1, pp. 61-79, illus. 4).—Two papers are presented:

I. *Seasonal changes of the carotenoid and vitamin A levels and the normal carotenoid-vitamin A ratio of the blood* (pp. 61-71).—The carotenoid and vitamin A levels of the blood of 49 cows maintained in 4 groups with carotenoid and vitamin A intake were determined periodically for 1 yr. Seasonal changes in the carotenoid level were mainly dependent on the carotenoid intake but varied with the age and breed of the animal. There were individual variations which were not statistically significant between the means of animals. Seasonal changes were dependent on carotenoid and vitamin A intake. Vitamin A levels showed temporary decreases during parturition, abortion, and acute infections, but rose immediately after feeding either shark-liver oil or yeast. A linear increase of vitamin A with increasing carotenoid levels was found. The ratio of vitamin A to carotenoid levels was established, decreasing with increasing carotenoid levels and reaching a constant value at high carotenoid levels. There were deviations in the ratio, however, and it was below normal in physiological disturbances and slightly above normal if the animals were subject to decreasing carotenoid intake and well above normal if a vitamin supplement was fed. Breed differences in the ratio are briefly discussed.

II. *Carotenoids and vitamin A in the liver, their ratio and their relationship to blood levels* (pp. 73-79).—The carotenoid and vitamin A values were obtained from liver samples of cows in four dietary groups with different carotenoid and vitamin A intakes. The vitamin A levels were significantly different among three of the four dietary groups, but similar for the shark-liver-oil-supplemented group regardless of their basic ration. An optimum level for vitamin A storage was thus indicated. The livers of animals which had been maintained on a vitamin A-enriched ration for 6 to 8 mo. indicated a rather lasting effect on the vitamin A storage of a relatively short period of vitamin A feeding. Observations on livers from vitamin A-starved animals and partially hepatectomized animals indicated that utilization of stored vitamin A first forces available carotenoid stores to be converted into vitamin A, thus decreasing carotenoid level without decreasing the vitamin A level. A typical relationship between carotenoid levels and corresponding vitamin A levels appears to exist in the liver similarly to the A-carotenoid ratios observed in the blood. Changes in the ratio with differences in carotenoid levels are probably caused by the tendency to maintain a constant vitamin A store. The ratio was modified if the animal was fed vitamin A and in certain pathological conditions. A tendency toward a direct relationship between vitamin A stores and the vitamin A level of the blood was found to exist only when the former fall below normal levels.

Vitamin A, ascorbic acid, and spinal fluid pressure relationships in the young bovine, L. A. MOORE. (Md. Expt. Sta.). (*Jour. Nutr.*, 31 (1946), No. 2, pp. 229-236).—The increased spinal fluid pressure previously noted in the bovine to be associated with vitamin A deficiency (E. S. R., 86, p. 679) was further studied in three groups of calves. One group received various quantities of carotene in the form of dehydrated alfalfa leaf meal. There was an increased spinal fluid pressure accompanied by depressed ascorbic acid values in blood and spinal fluid. Even though normal ascorbic values in blood and spinal fluid were maintained by the

feeding of chlorobutanol or by the subcutaneous injections of ascorbic acid, there was still an increase in the spinal fluid pressure in vitamin A-deficient calves.

July-planted Hodo sorghum unsatisfactory for grazing by beef cattle after frosts, R. H. MEANS (*Miss. Farm Res. [Mississippi Sta.]*, 9 (1946), No. 1, p. 7).—There seems need for a suitable follow-up crop for beef cattle that may be harvested after oats, as on dallis grass pasture cattle begin to lose weight in December. A big problem for cattle production is to provide a satisfactory and economical supplemental feed from December 15 to March 20. In search of such a crop, a 15-acre field was planted with Hodo sorghum in July after harvesting an oat crop and pastured with 33 grade Angus cows. Soon after the first freeze the sorghum lodged and the heads were all on the ground within 2 weeks. The cattle lost an average of 51 lb. during the 35-day cattling-down period. After 1 week the frosted sorghum was not palatable, and after 2 weeks some of the cows were losing weight. The weather conditions were unfavorable, but not unusual.

Selecting, fitting, and showing the beef steer, R. S. GLASSCOCK (*Florida Sta. Bul.* 421 (1946), pp. 37, illus. 11).—General directions for selecting, feeding, grooming, and showing the steer, with instructions on making rope halters.

The vitamin D requirement of the sheep, E. D. ANDREWS and I. J. CUNNINGHAM (*New Zeal. Jour. Sci. and Technol.*, 27 (1945), No. 3, Sect. A, pp. 223-230).—The daily requirement for vitamin D of lambs from 6 to 12 mo. of age was approximately 180 International Units for each 100 lb. body weight. Sunlight was a natural source and calciferol was an available supplemental source of vitamin D. The composition of the blood of rachitic lambs was altered from the normal. Whole blood inorganic phosphate and serum calcium were reduced and plasma phosphatase increased. The ash content of rachitic bones was slightly less than normal.

Cooked potato silage gives good results in pig-feeding experiment, W. E. CONNELL and A. L. ESPLIN (*Colo. Farm Bul. [Colorado Sta.]*, 7 (1945), No. 6, pp. 14-15).—Continuing the study of the feeding of potatoes, made with lambs and steers (E. S. R., 94, pp. 247, 248), comparison of the use of silages for pigs showed that neither dehydrated potato pulp nor cooked potato silages produced as good gains as did corn. When fed free-choice with corn, the daily gain was increased from 0.55 to 1.36 lb. with the dehydrated potato pulp and from 0.95 to 1.48 lb. with the cooked potato silage. Raw potatoes proved unpalatable. The test was conducted with six lots of eight or nine pigs, the dehydrated potato pulp and cooked potato silage being fed with and without corn. Other lots received corn or raw potatoes alone. All were hand-fed soybean meal, alfalfa meal, and minerals.

Forage crops for pigs save harvested grain, P. G. BEDENBAUGH (*Miss. Farm Res. [Mississippi Sta.]*, 9 (1946), No. 1, p. 6).—In one trial, 3 groups of 10 pigs each were fed on ground corn with cottonseed meal or cottonseed meal and shrimp meal with soybean pasture. The average daily gains with the different protein supplements were 0.99 and 0.90 lb., respectively, as compared with 1.67 lb. gain produced in dry lot, in an 85-day experiment. In another experiment two varieties of soybeans were used for hogging down corn and soybeans in a 14-day trial. The average daily gains in this trial were 2.47 and 2.33 lb.

Effect of feeding green food to the pregnant sow on the incidence of piglet anaemia, R. BRAUDE and A. S. FOOT (*Vet. Jour.*, 102 (1946), No. 3, pp. 71-73, illus. 1).—The hemoglobin curves of the individual size of litters of sows receiving a concentrate mixture and minerals with and without 7 lb. of marrow-stem kale per day were compared. There was no reason to believe that lactational failure was due to the absence of kale in the rations of the three sows without it as contrasted with the pigs of four sows receiving kale. The hemoglobin levels of the sows dropped to a dangerously low level, but the feeding of kale had no effect. Direct dosing of the pigs with iron pyrophosphate caused a rapid recovery in hemoglobin level in some cases before the growth curve had been significantly affected.

Effect of thiouracil on growing swine, M. E. MUHRER and A. G. HOGAN. (Mo. Expt. Sta.). (*Soc. Expt. Biol. and Med. Proc.*, 60 (1945), No. 2, pp. 211-212).—Four groups of Chester White and Poland China crossbred-hogs were pair-fed for 28 days on rations made up of corn 60 parts, wheat 13, tankage and soybean oil meal 10 each, alfalfa meal 5, and mineral 2 parts by weight, plus 0.2 percent of thiouracil in the test ration. The average daily gains per head were 1.4 and 2.1 lb. for the check and thiouracil lots. The test animals were less active, and at the end of the period they were shorter and fatter than the controls. Although they gained weight more rapidly and more economically, it is believed that their increased gain was not true growth but "apparently an example of retarded growth with rapid gains in weight due to deposition of an excessive amount of fat."

A study of canine hysteria produced by feeding certain baked dog foods and wheat gluten flour, J. R. WAGNER and C. A. ELVEHJEM. (Wis. Expt. Sta.). (*Jour. Nutr.*, 28 (1944), No. 6, pp. 431-441, illus. 4).—Baked dog food containing wheat flour produced a type of nutritional canine hysteria which did not result when the wheat products were absent from the ration. The disease appeared to be caused by some toxic factor present in these products. Although the proteins of wheat products were deficient in lysine, protein and lysine supplements did not prevent the disease. Hysteria may be caused in dogs on nutritionally adequate rations by the addition of wheat gluten flour. A total of 12 dogs were included in the 6 experiments.

Poultry production, W. A. LIPPINCOTT, rev. by L. E. CARD (Philadelphia: Lea & Febiger, 1946, 7. ed., rev., pp. 440, illus. 238).—In this seventh edition (E. S. R., 82, p. 376), several chapters have been completely rewritten and a new chapter has been added on diseases and parasites.

Activity of synthetic estrogens on oral administration in the domestic fowl and turkey, R. G. JAAP. (Okla. Expt. Sta.). (*Endocrinology*, 37 (1945), No. 5, pp. 369-376).—"Seventeen synthetic estrogens have been tested for oral activity in the domestic fowl and turkey. All but two of these may be considered as derivatives of stilbene. Dianisylhexane was most active at the level of 10 mg. per pound of feed in the chick but practically inactive in the turkey poult. At levels of 20 or more milligrams per pound of feed, the dimethyl ether of diethylstilbestrol was the most potent estrogen for oral administration in both species. Compounds estrogenically inactive at the levels fed were dihydroxystilbene, its diacetate and its dimethyl ether; the dimethyl ether of benestrol; and triphenylethylene. In contrast triphenylchloroethylene was relatively active on oral administration in both species. Further data were obtained showing that estrogenic activity of these chemicals is greatly increased by solution in soybean oil before dispersion in the feed."

The effect of feeding thiouracil to hens upon the thyroid gland of chicks, F. N. ANDREWS and E. E. SCHNETZLER. (Ind. Expt. Sta.). (*Endocrinology*, 37 (1945), No. 5, pp. 382-384).—The thyroid glands of chicks from hens receiving thiouracil were definitely enlarged. Thiouracil was present in the eggs of hens treated with it. Egg white contained 0.07 to 0.15 mg. per gram and egg yolk 0.08 to 0.12 mg. per gram. There was no observable gross evidence of functional differences at the time of hatching or during the first week of life. At the level fed, the thiouracil apparently did not affect egg production, egg size, fertility, or hatchability in adult ♀ fowls. The study was based on eggs produced by two groups of 12 White Leghorn hens, one group of which received thiouracil at a level of 0.2 percent of the ration.

Crystalline vitamin B₁₂ in relation to the cellular elements of chick blood, C. J. CAMPBELL, M. M. McCABE, R. A. BROWN, and A. D. EMMETT (*Amer. Jour. Physiol.*, 144 (1945), No. 3, pp. 348-354).—Data are presented on the cellular blood elements of normal vitamin B₁₂-deficient, and vitamin B₁₂-treated chicks. Crystalline

vitamin B₁₂ prevented macrocytic anemia, leukopenia, and thrombopenia in chicks during the first 4 weeks of life. Since perosis occurred in chicks raised on a purified ration containing all of the known B vitamins in crystalline form supplemented with manganese, it is suggested that another perotic factor exists. Earlier work has been noted (E. S. R., 93, p. 485).

Rumen contents a promising source of B complex vitamins for poultry rations, P. R. FREY and F. H. KRATZER (*Colo. Farm Bul. [Colorado Sta.], 7 (1945), No. 6, pp. 7-9, illus. 1*).—The dry rumen contents of 140 steers contained averages per 100 gm. of 1,000 µg. of thiamin, 1,200 µg. of riboflavin, 4,300 µg. of niacin, and 4,900 µg. of pantothenic acid. The average dried rumen contents furnished about four times the requirement of riboflavin for the growing chick and breeder and eight times the requirement for the layer. In terms of pantothenic acid, the dried rumen contents furnished about four times the requirement for the growing chick and breeder and six times the requirement for the layer. Dried rumen contents of sheep as well as cattle contained large amounts of the vitamin B complex.

Soybean oil meal in poultry rations, T. B. CLARK and C. J. CUNNINGHAM (*West Virginia Sta. Bul. 325 (1945), pp. 15*).—A control ration containing 2.5 percent each of fish meal and meat scrap and 12.5 percent of soybean meal was compared for growth of chicks with a ration containing 2.5 percent of meat scrap and 17.5 percent of soybean meal as principal proteins in the first series and one containing 20 percent soybean meal in the second series. The control ration produced a significantly greater growth in both sexes with less feed per unit of gain up to 12 weeks of age. At 20 weeks of age the differences between the lots of pullets in the first series were negligible, while in the second series the chicks on the control ration were slightly larger than those on the soybean ration. The feed efficiency between 12 and 20 weeks was not consistent in the two experiments. Pullets taken from the growth trials were used in laying trials with determination of feed consumption during November and March. It was shown that for egg production a mash in which soybean meal is the sole source of supplementary protein will give satisfactory results when balanced with necessary vitamins and minerals. Some animal protein should be included in starting and hatching rations, and, although the studies do not show how much is necessary, a minimum of 2.5 percent seems needed. For rapid growth the animal protein should be supplied in part by fish meal.

Value of sunflower seed protein, C. R. GRAU and H. J. ALMQUIST. (Univ. Calif.). (*Soc. Expt. Biol. and Med. Proc., 60 (1945), No. 3, pp. 373-374*).—Tests with 2-week-old White Leghorn chicks on diets in which the entire 20-percent protein of the diet was supplied by a South American sample of sunflower seed meal with 46.7 percent protein or a laboratory-prepared meal with 39.9 percent protein indicated that the value of this product for chick growth and efficiency of feed utilization is very high. According to the authors, "it compares favorably with other recognized complete sources of amino acids for the chick. In fact, the protein of sunflower seed meal is the most complete vegetable protein for chick growth that we have studied." Even lysine was present in adequate amount.

Mung beans as a source of protein for turkey poults, T. T. MILBY. (Okla. Expt. Sta.). (*Okla. Acad. Sci. Proc., 25 (1945), pp. 50-53, illus. 2*).—Cracked mung beans may be used to replace at least two-thirds of the vegetable proteins of turkey starting rations. Mung bean protein differs from the protein of cottonseed meal and soybean meal in that it does not need cooking. The tests in 1943-44 were conducted with 5 lots of about 140 Bronze and White Holland day-old poults each.

Dietary anemia in the pigeon, H. R. STREET. (*Jour. Nutr., 28 (1944), No. 6, pp. 395-406, illus. 4*).—A severe anemia developed in pigeons on a ration containing thiamine, riboflavin, pyridoxine, nicotinic acid, and calcium pantothenate, but lacking other members of the vitamin B complex. Extracts of yeast, liver, or rice bran

restored hemoglobin levels to normal. The antianemic agent in extracts of liver remains in the filtrate upon treatment with fuller's earth at pH 4. A second or weight restoration factor seemed to be required by the pigeon. In all the 36 pigeons placed on the experiment, there was an initial hemoglobin level of 15 gm. per 100 cc. of blood, or higher. This was rapidly reduced during the first week when the birds received none of the B factors other than thiamine. After 7 weeks the hemoglobin had fallen to levels of 12 gm. per 100 cc. or lower, with a range of 8.5 to 12 gm. in 23 of 34 surviving birds.

A short period for obtaining R. O. P. egg weights, E. E. SCHNETZLER. (Ind. Expt. Sta.). (*Poultry Sci.*, 25 (1946), No. 1, pp. 28-32).—Egg weights of 1,802 R. O. P. candidates of 3 Indiana breeders for the 4 spring months only were practically the same as for the entire year. Correlations between the weights determined by the two methods in three flocks were 0.96, 0.98, and 0.99. For 90 percent of the birds the differences between the averages for the two methods were less than 0.7 oz. per dozen. There was a considerable reduction in the labor-saving of the two methods, since only approximately 50 percent as many weights had to be taken.

DAIRY FARMING—DAIRYING

Comparison of molasses-grass silage and ground barley-grass silage as feeds for the milking cow, W. A. KING (*New Jersey Stat. Bul.* 722 (1945), pp. 18).—Continuing this series of studies (E. S. R., 92, p. 693), 3 groups of 5 cows each were fed for 18 weeks on grass silage or corn silage. The first-cutting grass was preserved with either molasses or ground barley and compared with the corn silage for maintenance of condition and total milk production. Both the molasses and ground barley made palatable silages, but the ground barley-grass silage was the less palatable of the two although its feeding value was significantly the greater. Additions of ground barley to grass resulted in a well-preserved silage, and both were more palatable than corn silage, and an abnormal condition developed with the latter in one cow. The total digestible nutrients and metabolizable energy of the ground barley-grass silage were higher than those of the molasses-grass silage, but lower than expected, as was shown in the studies of the chemical composition of the silage and digestibility of the dry matter and nitrogen-free extract of the barley silage in total digestible nutrients and metabolizable energy. The loss amounted to about 30 percent of the nutrients of the ground barley or 10 percent of the nutrients of the entire silage. When fed alone ground barley-grass silage was more digestible than when fed with hay and grain. The digestibility of the crude fiber of the ground barley-grass silage was significantly lower than that of the molasses-grass silage. Losses of nitrogen on drying silage and feces caused significant error in the coefficient of digestibility of crude protein and especially in protein metabolism results. Mixed grass silage preserved with either molasses or ground barley was conducive to the retention of nitrogen, calcium, and phosphorus.

Comparison of molasses-timothy silage and ground barley-timothy silage as feeds for the milking cow, W. A. KING (*New Jersey Stat. Bul.* 723 (1945), pp. 17).—In this, the fifth study of grass silages for milk cows (see above), experiments were made on (1) the feeding value of timothy silage preserved with molasses or ground barley, (2) the apparent digestibility and metabolizable energy of these silages, and (3) the protein and mineral metabolism of cows fed on them. Fifteen cows were divided into 3 groups of 5 each, all of which received hay and grain; this being supplemented with corn silage, molasses-timothy silage, or ground barley-timothy silage for two 6-week and one 3-week periods. The timothy silage preserved with 200 lb. ground barley to a ton of green material resulted in a palatable and well-preserved silage. A greater quantity of nutrients was present than in

timothy silage preserved with molasses, but less than in good corn silage on the dry-matter basis. Molasses-timothy silage was more palatable than ground barley silage. In terms of 4 percent fat-corrected milk per pound of total digestible nutrients, corn silage and molasses-timothy silage were about equal, whereas ground barley-timothy silage was significantly lower. Cows fed corn silage made better gains in live weight and better milk production than cows fed the timothy silages. All nutrients of the ground barley-timothy silage fed as a part of a complete ration were more digestible than those of molasses-timothy silage, and the metabolizable energy was higher. When fed alone the digestibility of ground barley-timothy silage seemed to be depressed. Additions of ground barley as a silage preservative failed to increase the total nutrients of the timothy silage as much as would be anticipated. This is explained as due to a loss of nutrients of the ground barley calculated to be 25 percent. The importance of fresh samples of silage and feces for nitrogen analysis is stressed, as in the above bulletin. Also losses of volatile acids should be considered. Calcium was well utilized, whereas nitrogen and phosphorus were retained in two-thirds of the individual cases when the timothy silages were fed as a part of a complete ration with hay and grain.

'Distillers' by-products and soybean meal in dry calf starters for calves on limited quantities of milk. H. P. DAVIS and G. W. TRIMBERGER (*Nebraska Sta. Res. Bul.* 142 (1946), pp. 29).—A total of 55 grade Holstein heifer calves received whole milk for 3 weeks, after which they were fed to 6 mo. of age in 6 groups. Each calf was allowed 50 lb. of skim milk, after which they were expected to obtain their nutrients from the protein supplement in liquid form until the calf reached 52 days of age, when a calf starter and later a grain mixture and alfalfa hay were provided. The basal grain mixture used throughout, but modified during the dry calf starter period, was 150 lb. of ground yellow corn, 150 lb. of ground oats, 100 lb. of wheat bran, 100 lb. of soybean meal, 12 lb. of steamed bone meal, and 6 lb. of iodized salt.

Various protein supplements were added to this basal mixture during the first 15 weeks, to make up 6 calf starters, with 15 to 18 percent protein. These included 50 lb. of soybean meal for group 1, 37.5 lb. of soybean meal plus 13.8 lb. of nonfat dry milk solids for group 2, 200 lb. of distillers' grain solubles for group 3, 25 lb. of soybean meal plus 26.6 lb. of nonfat dry milk solids for group 4, 50 lb. of nonfat dry milk solids for group 5, and 200 lb. of distillers' grain insolubles for group 6. Group 2 had approximately one-fourth and group 4 approximately one-half the nonfat dry milk solids of group 5 (control). Vitamins A and D were supplied first as a liquid and later as a part of the dry calf starter.

The calves of group 1 did not make consistent gains in weight until after the fifth week, and 3 of the 8 calves had to have additional whole and skim milk. In group 2 the calves made small gains in the early part of the experiment, and it was necessary to feed additional whole and skim milk to 2 of the 9 calves. During the first 5 weeks the calves in group 3 did not make consistent gains and it was necessary to feed 2 of the calves additional whole and skim milk. Additional skim milk seemed needed by only 1 of the 10 calves of group 4. The 10 calves of group 5 made gains every week and the largest total gain, but the gains were not always uniform. No additional milk beyond the 50-lb. skim milk was given to this group. Group 6 received the same liquid feed as group 5 for the first 30 days, and made consistent but somewhat irregular gains throughout the experiment.

Measurements of the calves and height at withers showed no significant differences by the several groups at the various stages of the experiment. The heart girth may possibly have shown significant differences at 2 mo. of age. The greatest inequalities during the early stages of the experiment occurred in weight, but there were no significant differences revealed by skeletal measurements. Differences in weight

were largely due to differences in degree of fatness, which was mainly eliminated by the time 6 mo. of age was reached. Nonfat dry milk solids had an ameliorating effect even in small amounts when substituted for small quantities of soybean meal. A dry calf starter consisting of 10 percent of nonfat dry milk solids produced normal gains with young calves. Satisfactory growth was produced with grain mixture containing soybean meal as the principal protein supplement as the calves reached 18 weeks. Distillers' dried grains, both solubles and insolubles, used as the principal high protein supplement in a dry calf starter gave good results after 2 mo. of age. Nonfat dry milk solids were particularly useful in getting calves started growing until the time they eat grain and hay for feed. Data are given on the feed allowed each calf, with the initial and final weights and gains and measurements.

Modern method of raising calves, H. C. DICKEY. (Vt. Expt. Sta.). (*Holstein-Friesian World*, 43 (1946), No. 5, pp. 17-18, 127).—Modern methods of feeding and management are discussed. Daily feeding schedules for calves of various dairy breeds are included.

Milk cows in miniature, W. W. SWETT. (U. S. D. A.). (*Guernsey Breeders' Jour.*, 69 (1946), No. 5, pp. 480-482, 489-490, illus. 2).—A recent survey of mammary development of 52 Holstein and 45 Jersey cows at different ages in the U. S. D. A. Beltsville herd showed that those which had been graded as calves for mammary development were most accurate as an indication of milk production in the first lactation when the production was estimated on calves 3 to 5 mo. of age, but the grades assigned for 6 mo. of age showed little if any positive production relationship. For the Holsteins, the unweighted milk production average for the empirical grades (as calves) 1, 2, and 3, was 16,243 lb. of milk in the first lactation, grades 4, 5, and 6, 18,369 lb., grades 7, 8, and 9, 19,639 lb. of milk, and for Jerseys, grades 1, 2, and 3, 10,243 lb. of milk, grades 4, 5, and 6, 12,707 lb. of milk, and grades 7, 8, and 9, 14,634 lb. of milk in the first lactation.

High average production by Calhoun dairy herd (*Dairy Res. Digest [Louisiana Sta.]*, 4 (1946), No. 1, p. 2).—Shortage of labor made it necessary to do away with silage for the dairy herd and feed alfalfa hay and pasture this crop. The use of improved permanent pasture plus oats for fall, winter, and spring and sudan grass for late summer greatly assisted in maintaining the high production level obtained.

Six thousand pounds milk per acre (*Dairy Res. Digest [Louisiana Sta.]*, 4 (1946), No. 1, p. 2).—Higher milk yield was produced from renovated pasture.

The estimation of the weight of bulls from heart girth measurements, C. BRANTON and G. W. SALISBURY. (Cornell Univ.). (*Jour. Dairy Sci.*, 29 (1946), No. 3, pp. 141-143, illus. 1).—The coefficient of correlation between heart girth and weights of 25 Holstein and 25 Guernsey bulls ranging in weight from 852 to 2,351 lb. was 0.976. The regression of actual live weight on heart girth was indicated by $X = 53.42 Y - 2.827.40$, wherein X = the calculated estimate of weight and Y = the measured heart girth. The correlation coefficient between body weight and semen volume was 0.2079, which was not significant.

Some observations on the total ketone bodies of the blood of apparently healthy dairy cattle, J. SAMPSON and L. E. BOLEY. (Univ. Ill.). (*Cornell Vet.*, 35 (1945), No. 4, pp. 314-320).—The ketone bodies of the blood of cows in lactation, of dry cows, and of heifers were found to be significantly greater during the months of June and July than during November and January. There was some evidence of an inverse relationship between the length of lactation and total ketone content of the blood of dairy cows, particularly with reference to the first 4 weeks as contrasted with the subsequent period of milk production. Differences of breed seemed to bear no significant relation to the variation in the ketone content of the blood of normal healthy cows. The mean or average value for 49 lactating cows in June

and July was 4.25 mg. and for 51 lactating cows in November and January 0.74 mg. per 100 cc. of blood.

Studies on ketosis in dairy cattle, VII, VIII, J. C. SHAW. ([Conn.] Storrs Expt. Sta.). (*Jour. Dairy Sci.*, 29 (1946), No. 3, pp. 131-139, illus. 1; pp. 151-155).—Continuing this series (E. S. R., 93, p. 488), two papers are presented:

VII. The efficacy of B vitamins and methionine in the treatment of ketosis.—Neither methionine nor thiamine hydrochloride administered orally or intravenously, alone or in combination with nicotinic acid, calcium pantothenate, riboflavin, pyridoxine, *p*-aminobenzoic acid, inositol, choline, and biotin, were effective in the treatment of seven cows with ketosis. Data were recorded for the cattle on the daily blood analysis up to 8 to 60 days for different cows on the blood glucose, blood acetone bodies, milk production, and treatment with one or more of the B vitamins.

VIII. Spontaneous recovery.—Data are presented on the milk production, blood glucose, or blood acetone bodies of five cows which spontaneously recovered from ketosis in about 27 to 50 days without treatment, thus emphasizing need for care in interpretation of results on effects of treatment.

Ketosis in the Hawaiian Islands, J. M. HENDERSHOT (*Jour. Amer. Vet. Med. Assoc.*, 108 (1946), No. 827, pp. 74-75).—This condition is reported as occurring in the Hawaiian Islands not only in dairy cows but in range cattle kept in certain areas of Molokai where at times the only available forage is the Kiawe bean (*Prosopis juliflora*). Tests with steers indicated that the vitamin A deficiency hypothesis as to the causative factor may be subject to question and that the functional capacity of the liver may be a promising subject for investigation.

Pasteurization of milk, cream, and dairy by-products (Canada Dept. Agr., *Farmers' Bul.* 33, rev. (1945), pp. 28, illus. 20).—The primary purpose of this bulletin is to effect a greater efficiency in the pasteurization of milk, cream, and dairy byproducts in Canada, and to present in a concise form information with respect to pasteurization methods and equipment.

Cleansing of square and round milk bottles, T. V. ARMSTRONG and L. H. BURGWALD. (Ohio State Univ.). (*Milk Dealer*, 35 (1946), No. 6, pp. 52, 124-129, illus. 1).—This study is concerned with the comparative cleansability of the square bottle and its degree of sterility as compared with the round bottle when washed under identical conditions. Several hundred washed bottles were obtained from nine plants using seven types of washers. Examination of quarts and half pints as received and comparisons of the effect of a chlorine rinse indicated that "there is no difference in the commercial practicability of cleansing and sterilizing the returnable square milk bottle and the conventional round bottle in typical dairy soaker equipment."

A light-sensitive enzyme in cow's milk, H. D. KAY (*Nature* [London], 157 (1946), No. 3990, p. 511).—Observations by Mattick and Kay (E. S. R., 79, p. 384) of losses in the lipase content of milk kept in glass bottles on the laboratory bench for a few hours have been resumed, and it is concluded that the lipase (tributyrase) of cow's milk is quite sensitive to sunlight. Exposure to bright sunshine of fresh milk in glass vessels to a depth of about 1 cm. and at a temperature under 5° C. was found to destroy 40 percent of the enzyme in 10 min. and about 80 percent in 30 min. Exposure out of direct sunlight on a laboratory window sill may cause a 30-percent destruction in 30 min., and a 30-min. exposure to an 800-w. (220-v.) quartz mercury lamp at a distance of 15 cm. may destroy 75 percent of the lipolytic power. Sunlight falling directly on the milk was rather more effective than sunlight through glass, but the destructive effect of sunlight was greatly minimized by removal of oxygen and less markedly by the addition of sodium cyanide. On the other hand, the rate of photo-destruction could be considerably increased by the addition of riboflavin. In milk exposed for a few minutes to sunlight and then kept in the dark, the destruction of lipase continued rapidly at first but ceased in about 3 hr., and

fresh milk added to milk in which the lipase was completely inactivated by light lost none of its activity even upon standing for several hours.

The vitamin content of mare's milk, A. D. HOLMES, B. V. McKEY, A. W. WERTZ, H. G. LINDQUIST, and L. R. PARKINSON. (Mass. Expt. Sta.). (*Jour. Dairy Sci.*, 29 (1946), No. 3, pp. 163-171).—The average values for the milk of three Percheron mares during normal lactation were as follows: "Ascorbic acid 12.9 mg., nicotinic acid 0.72 mg., pantothenic acid (three samples) 2.77 mg., riboflavin 0.11 mg., thiamine 0.39 mg. per liter, fat 1.2 percent, fat globule size 3.4 μ , total solids 10.20 percent. Of these values ascorbic and nicotinic acid, riboflavin, fat, and total solids were lower than the corresponding values for cow's milk, but the thiamine values were higher."

Bacteriology of butter.—VIII [a], Salt distribution in butter and its effect on bacterial growth, W. H. HOECKER and B. W. HAMMER (*Iowa Sta. Res. Bul.* 339 (1945), pp. 709-762, illus. 2).—In continuation of this series (E. S. R., 82, p. 814), the micromethod of Guthrie and Ross (E. S. R., 30, p. 877) was used for ascertaining the distribution of salt and moisture in normal and abnormal commercial butter. The salt in some samples was uniformly distributed, but in others it was not. There was no significant difference in the salt distribution before and after printing, but the moisture was more thoroughly incorporated in the butter before printing than after. The salt was more uniformly distributed as working was continued. Salt was unevenly distributed in some samples with abnormal flavors but not in others before and after printing. In mottled butter usually less salt was found in the light-colored than in the dark-colored portions, but in butter having a conspicuous color defect the light-colored portions generally contained more salt than the dark-colored portions. With normal butter there was less variation in salt than in moisture. The percentages of salt in the serum calculated from analysis of microportions frequently varied less than the percentages of moisture. In most samples there was a correlation between the distribution of moisture in the butter, as shown by the distribution of the number and size of moisture droplets when butter was freshly cut. In butter with abnormal flavor, moisture was often not as uniformly distributed as in thoroughly worked normal butter. Salt was uniformly distributed in the serum of some samples but not in others, and the salt content of large moisture droplets varied considerably in some samples but not in others. Bacterial action was greatly inhibited in butter held at 15.5° C. by the addition of 1.5 percent salt. The distribution of salt influenced the growth of various organisms in butter churned from inoculated pasteurized cream. The lowest bacterial counts were obtained in butter having the salt well distributed. Growth was most rapid in unsalted butter. The numbers of organisms were less and they were more uniformly distributed in experimental butter containing organisms capable of producing a defect when the salt was well dispersed than when it was poorly dispersed. Cultures from drops of moisture appearing on the freshly cut surface of the butter were variable, some showing excessive growth and others no growth. The pH of the serum of experimental butter churned from cream inoculated with lactic-acid-producing streptococci and held at 15.5° decreased more with salt poorly distributed than when well distributed, but in other comparisons there were no significant differences. Increases in the acid numbers of the fat of experimental salted butter churned from pasteurized cream inoculated with lipolytic organisms and held at 15.5° were influenced by the distribution of salt, the largest increases occurring when the salt was poorly distributed. When butter from cream inoculated with organisms capable of producing a defect was held at 15.5° with salt well distributed, it was usually free from the defect, but when the salt was poorly distributed the defect developed. Poorly worked unsalted butter was more likely to show defects. Frequently defects did not develop from *Pseudomonas putrefaciens* added either to the

cream or to the wash water when the butter had salt well distributed, whereas butter having the salt poorly distributed sometimes showed the defects. Unsalted butter usually became putrid regardless of whether the organism was added to the cream or the wash water. Greater inhibition of organisms producing defects occurred when the salt was well distributed than when poorly distributed, and they developed more uniformly in unsalted butter. There was considerable lack of uniformity in the effects of various conditions on the development of flavor defects.

Relation of corn and alfalfa silage to the quality of cheese and its carotene and vitamin A content, K. HIGUCHI, W. V. PRICE, and W. H. PETERSON. (Wis. Expt. Sta.). (*Jour. Dairy Sci.*, 29 (1946), No. 3, pp. 157-162).—Cheese from the milk of groups of five cows each on corn silage, corn and alfalfa silage, and alfalfa silage only was studied with respect to its quality and carotene and vitamin A contents. Cheese made from milk produced on an alfalfa silage ration equaled or excelled that in quality and vitamin A potency of cheese made from milk produced on a corn silage ration. The distribution of vitamin A potency in cheese making was shown to be such that 85 percent was retained in the cheese, 7 percent found in the whey, and 8 percent unaccounted for. A pound of milk, which contained on the average 83 μ g. of carotene and 109 μ g. of vitamin A, gave cheese containing 69 μ g. of carotene and 93 μ g. of vitamin A. The whey accounted for 6.5 μ g. of carotene and 7.5 μ g. of vitamin A, thus leaving about 7.5 μ g. of carotene and 8.5 μ g. of vitamin A unaccounted for. The vitamin A potency of the cheese remained unchanged during storage for 1 yr. The carotene or vitamin A were ascertained for brick, Cheddar, and Swiss cheese by methods of Berl and Peterson (*E. S. R.*, 92, p. 304).

VETERINARY MEDICINE

Crotalaria spectabilis poisoning in Louisiana livestock, P. L. PIERCY and L. L. RUSOFF. (La. Expt. Sta.). (*Jour. Amer. Vet. Med. Assoc.*, 108 (1946), No. 827, pp. 69-73, illus. 4).—This is a more technical account than previously noted (*E. S. R.*, 94, p. 518). Experimental feeding of cattle and chickens and field studies with cattle demonstrated toxicity of a chronic nature with fatal effects after the slow, cumulative assimilation of the toxic principle weeks or even months after grazing or feeding. The poisonous alkaloid, monocrotaline, was isolated from all portions of immature plants in flowering and early pod stages. When injected into chickens, this material acted identically with the poisonous principle which had been isolated in Florida from mature plants. Monocrotaline was most highly concentrated in the seed portions of the plant.

Notwithstanding the outstanding value of *C. spectabilis* as a leguminous cover crop and its low palatability, its restriction to areas not grazed by livestock is deemed necessary.

Sex hormones in veterinary practice, D. K. DETWEILER (*Pa. Univ., Vet. Ext. Quart.* No. 98 (1945), p. 26, illus. 3; *abs. in Vet. Jour.*, 102 (1946), No. 2, pp. 45-52).—It is the purpose of this paper to discuss the physiology of the sex hormones and to correlate this with the products now available to the veterinarian.

Studies on antimalarial drugs: The metabolism of quinine and quinidine in birds and mammals, F. E. KELSEY, F. K. OLDHAM, and E. M. K. GEILING (*Jour. Pharmacol. and Expt. Ther.*, 85 (1945), No. 2, pp. 170-175, illus. 1).—In vitro studies indicated that quinine is more readily metabolized than quinidine in the rabbit and rat, but that the reverse is the case with the chicken, turkey, pigeon, duck, and goose. In vivo, the rabbit metabolizes quinine much more rapidly than quinidine, but in the duck and chicken the two drugs are metabolized at approximately the same rate. The duck metabolizes both alkaloids more slowly than does the chicken, and the two species differ in the distribution of the drugs between red cells and plasma.

The degradation of quinine in the duck, chicken, and dog, E. H. DEARBORN and E. K. MARSHALL, JR. (*Jour. Pharmacol. and Expt. Ther.*, 85 (1945), No. 2, pp. 202-205).—The authors report that there are probably at least two degradation products of quinine to be found in the duck after administration of quinine. The degradation of quinine appears to be qualitatively similar in ducks, chicks, and dogs.

The biological activity of phenolic compounds: The effect of surface active substances upon the penetration of hexyl resorcinol into *Ascaris lumbricoides* var. suis, A. E. ALEXANDER and A. R. TRIM (*Roy. Soc. [London] Proc., Ser. B*, 133 (1946), No. 871, pp. 220-234, illus. 7).—The effect of sodium cholate, sodium oleate, and cetyl trimethyl ammonium bromide (C.T.A.B.) upon the penetration of hexyl resorcinol into the pig roundworm has been measured quantitatively, and parallel measurements carried out upon the interfacial activity of these solutions against an inert mineral oil. In all three cases a marked similarity of action, differing only in degree, was observed. Using a fixed hexyl resorcinol concentration (0.025 percent) the soap in dilute solution accelerated the penetration of this drug, the maximum accelerations being in the order sodium cholate $\approx$ sodium oleate $<$ C.T.A.B., but when present in high concentration the penetration was completely inhibited. The soaps alone were found to penetrate *Ascaris* very slowly, if at all, the amounts taken up being reasonably explained on the basis of surface adsorption only.

The possible bearings of the findings upon in vivo activity of hexyl resorcinol as an anthelmintic, and upon drug action in general, are briefly mentioned.

Anthrax treated with sulfadiazine, L. C. ABELSON ([U. S.] *Off. Surg. Gen., U. S. Army Med. Dept. Bul.*, 5 (1946), No. 3, pp. 363-364).—A case is reported of an Army sergeant in China with a lesion from which an organism presenting the appearance of *Bacillus anthracis* was observed. He was brought to an ambulatory condition in the absence of anti-anthrax serum and penicillin by oral and intravenous injections of sulfadiazine.

The Physaloptera (Nematoda) of carnivores, B. B. MORGAN. (Univ. Wis.). (*Wis. Acad. Sci., Arts, and Letters, Trans.*, 36 (1944), pp. 375-388, illus. 14).—The purpose of this paper is to present briefly what is known of the various species of *Physaloptera*, a redescription of one species, a key to the species found in carnivores, and a world host list. About 60 citations to the literature are appended.

Ps. pyocyanea: Study in vitro and in vivo of the bactericidal and therapeutic properties of α -oxyphenazine and a lipoidal product, J. ZWEIG (*Vet. Jour.*, 102 (1946), No. 3, pp. 55-70, illus. 5).—This investigation was undertaken to study methods of preparation and the chemical and antibiotic properties in vitro and in vivo of various metabolites obtained from *Pseudomonas pyocyanea* cultures, with special attention to α -oxyphenazine and the lipoidal products against organisms of veterinary importance. The α -oxyphenazine was obtained in a crystalline state in a high degree of purity and was shown to be active in vitro against the following organisms: *Corynebacterium pyogenes*, *Vibrio foetus*, *Pasteurella bovis*, *Bacillus anthracis*, *Streptococcus agalactiae*, *S. dysgalactiae*, *Staphylococcus aureus*, *Brucella abortus*, *Bacillus coli*, *Salmonella choleraesuis*, *Clostridium welchii*, *C. septique*, *C. chauvoei*, and *C. tetani*. Its use in *Brucella abortus* infections in guinea pigs and cows and in bovine mastitis is discussed.

In general, the lipoidal products were obtained in a crude form by chloroform extraction of dried bacterial bodies or of whole lipid culture, and proved to be active against *Bacillus anthracis*, *Brucella abortus*, *Streptococcus agalactiae*, *S. dysgalactiae*, *Staphylococcus aureus*, human and bovine, and *Mycobacterium tuberculosis*. The therapeutic effects were compared to those of α -oxyphenazine in tests with *B. abortus* in guinea pigs and cows and bovine mastitis, and tests were also made with tuberculosis in guinea pigs.

A case of canine *S. typhimurium* infection with notes on other *Salmonella* infections in animals, J. F. SHIRLAW, S. McDONALD, and W. HAYES (*Indian Jour.*

Med. Res., 33 (1945), No. 1, pp. 1-3).—This is a case report of the isolation in the dog of a strain identical, biochemically and serologically, with *S. typhimurium*.

Salmonella epidemic from commercially prepared sandwiches, A. P. GREENBLATT, P. D. DELAY, L. BRESLOW, and I. J. GREENBLATT ([U. S.] *Off. Surg. Gen.*, U. S. Army Med. Dept. *Bul.*, 5 (1946), No. 3, pp. 345-348).—In an outbreak of *Salmonella* food poisoning, 97 cases were hospitalized during a 4-day period. The infected food was a mayonnaise spread used in commercially prepared sandwiches. Convalescent patients excreted the organism for as long as 38 days, and it is pointed out that while rodents, poultry, and eggs have received attention as carriers of *Salmonella*, "perhaps the human carrier makes a greater contribution to the *Salmonella* problem than current emphasis indicates."

Phase variation of *Andrewes* in a coliform bacterium, P. R. EDWARDS and M. G. WEST. (Ky. Expt. Sta.). (*Jour. Infect. Diseases*, 77 (1945), No. 3, pp. 185-186).—A coliform culture which fermented lactose, coagulated milk, and liquefied gelatin is described. It possessed *Salmonella* H and O antigens and was diphasic. It is represented by the antigenic formula XVI: $z_{10}-c, n \dots$

A simple technique for the fixation and staining of *Trichomonas* in cultures and vaginal mucus, V. D. VAN SOMEREN (*Vet. Jour.*, 102 (1946), No. 3, pp. 73-78, *illus.* 4).—This iodine fixation technic is described as employed with *T. foetus* of bovines. Notes on the morphology of this species are included.

Studies of vesicular stomatitis, with special reference to a virus of swine origin, M. S. SHAHAN, A. H. FRANK, and L. O. MOTT. (U. S. D. A.). (*Jour. Amer. Vet. Med. Assoc.*, 108 (1946), No. 826, pp. 5-19, *illus.* 10).—A strain isolated from a natural outbreak in swine and designated as N.J.-M was studied in comparison with three previously typed strains from cattle and horses (N.J., Ind., and Ind.-C). The N.J.-M strain was pathogenic for locally exposed horses, cattle, swine, and guinea pigs. Hog cholera-immune swine inoculated intravenously with vesicular stomatitis virus readily contracted the latter disease. When the virus was inoculated at the same time with large doses of hog cholera virus, there was a tendency toward delay or absence of formation of vesicular lesions.

"Swine readily contract vesicular stomatitis through contact with affected animals under certain conditions. Contact with convalescent swine or pens from which convalescent swine had been recently removed failed to convey the infection. Occult, or inapparent, infection, resulting in immunity, may result from contact with swine in the acute stages of the disease. Pigs appear to be less susceptible to infection by contact than older swine. Virus was demonstrated in the blood of clinically affected swine which became infected through contact."

Secondary lesions occurred in 13 of 26 swine primarily infected by contact or through inoculation on the snout with New Jersey type virus. Of 18 swine similarly infected with Indiana type virus, none developed "secondaries."

Sheep failed to develop vesicular stomatitis when inoculated with either Indiana or New Jersey type virus. Cattle failed to develop vesicular lesions when inoculated intramuscularly with either type of vesicular stomatitis virus. Some but not all of such cattle became immune. It is suggested that the contrasting results from lingual inoculations of sheep and intramuscular inoculations of cattle with the viruses of foot-and-mouth disease and vesicular stomatitis may be properly applied as an integral part of differential diagnosis of the two diseases. "Either inapparent or clinically evident vesicular stomatitis infections generally produce substantial immunity to the same immunologic type of virus. In some cases, however, measurable resistance is of short duration. In consequence, it becomes necessary to check the immunity of animals that have recovered from type specific infection before proceeding with tests to determine the immunologic character of a virus of unclassified type."

Studies on the immunization of guinea pigs against *Brucella* infection, I. LIVE, F. G. SPERLING, and E. L. STUBBS. (Coop. U. S. D. A. et al.). (*Jour. Infect. Diseases*, 77 (1945), No. 1, pp. 16-24).—An active immunity against moderate doses of virulent *B. abortus* was obtained in guinea pigs both with sonic extract of *B. abortus* containing a total of 5 mg. of protein injected either subcutaneously or intracutaneously and with subcutaneous injections of a total of 75 billion to 300 billion ether-killed whole *B. abortus* organisms. Even more effective in protecting guinea pigs against *Brucella* infection, however, were intracutaneous injection of one-tenth the number of ether-killed *B. abortus*.

Injections of sonic extract or ether-killed whole cells of *B. abortus* produced either low agglutinative titers or no demonstrable agglutinins in the blood serums of the guinea pigs. Furthermore, animals which had acquired an immunity did not develop agglutinins as a result of the injection of the infecting dose. Therefore, it would appear that the immunity produced did not depend upon the presence of serum agglutinins.

The culturing of blood clots for *Brucella* organisms, D. E. WEST and E. K. BORMAN (*Jour. Infect. Diseases*, 77 (1945), No. 3, pp. 187-192).—The development of a method for routine culturing of *Brucella* from clots of blood specimens received for agglutination tests is described. By its use 40 *B. abortus* and 2 *B. suis* cultures were isolated from the clots of 4,051 routine blood specimens received for agglutination test. The method is deemed a valuable supplement to the agglutination test as a diagnostic aid in suspected brucellosis.

Progress in the control of contagious abortion in New Zealand by vaccination, M. B. BUDDE (*Austral. Vet. Jour.*, 21 (1945), No. 5-6, pp. 122-129).—In studies with strain 19 of *Brucella abortus*, supplied in 1941 by the U. S. D. A. Bureau of Animal Industry, it was found that of 15 heifers vaccinated as calves with strain 19 and artificially exposed to virulent infection during pregnancy, 2 aborted from brucellosis, 1 aborted from a nonspecific cause, 1 calved prematurely, and 11 calved normally. Three of these heifers became permanently infected with brucellosis. Of 15 unvaccinated heifers similarly exposed to infection during pregnancy, 9 aborted, 1 calved prematurely, and 5 calved normally. Eleven of these heifers became permanently infected with brucellosis. In a field trial of calfhoo vaccination commenced in New Zealand in 1942, there were 22 abortions from all causes out of 465 first pregnancies of vaccinated heifers, or less than 5 percent in 1943. Thirty-two percent of unvaccinated heifers aborted in these herds in 1942. Of 293 second pregnancies of these vaccinated animals in 1944, 4, or 1.4 percent, terminated in abortion. In 1944, of 10,725 first pregnancies of heifers vaccinated as calves only 3 percent terminated in abortion. Twenty-two percent of unvaccinated heifers aborted in these herds in 1943.

It is stated that 43,000 heifer calves were vaccinated in New Zealand in 1944 and 107,000 in 1945.

Studies on the detection of mastitis in New Zealand dairy herds.—V, Composition of milk from quarters reacting to the bromthymol blue test for mastitis, F. H. McDOWELL (*New Zeal. Jour. Sci. and Technol.*, 27 (1945), No. 3, Sect. A, pp. 258-269).—Individual quarters of cows' udders were classified as negative and positive on the basis of the reaction of the foremilk to the bromthymol test. The results showed, in the great majority of cases, the abnormalities in composition associated with mastitis milk. The reacting quarters yielded a smaller volume of milk than the corresponding sound quarters.

Studies in infectious mastitis.—I, Penicillin as a therapeutic agent, J. L. BYRNE, J. W. PULLIN, and H. KONSK (*Canad. Jour. Compar. Med. and Vet. Sci.*, 10 (1946), No. 1, pp. 16-23).—This preliminary report deals with work in which a total of 266 quarters—179 infected with *Streptococcus agalactiae*, 6 with *S. dysgalactiae*, 5 with

S. uberis, 21 with unidentified streptococci, 49 with pathogenic staphylococci, and the remainder showing only clinical and chemical manifestations of infection—were treated with penicillin. From one to six treatments were given at 4-day intervals. The number of Oxford units ranged from 10,000 to 100,000, and the volumes of diluent (sterile physiological saline) varied from 25 cc. to 250 cc. Best results, particularly in streptococcic mastitis, were obtained when 40,000 Oxford units dissolved in 100 cc. of diluent were employed. Under these conditions, 204 of 266 treated quarters recovered in from one to three treatments and 38 failed to show improvement after six treatments.

Penicillin and mastitis control, C. S. BRYAN. (Mich. State Col.). (*Milk Plant Mo.*, 35 (1946), No. 2, pp. 27–28, 65).—This is a practical discussion of the penicillin treatment. In conclusion it is pointed out that "in mastitis of cattle prevention is the most important item in dealing with the disease. Chemotherapeutic agents may be successful in curing many of the udder infections, but they do not protect the recovered cow from reinfection. Penicillin can cure many cases of infectious mastitis, but responsibility for the conduct of preventive—milking and herd management—procedures will always remain on the shoulders of the dairyman."

Bovine trichomoniasis, B. B. MORGAN. (Wis. Expt. Sta.). (*Minneapolis 15: Burgess Pub. Co.*, 1946, rev., pp. 165+, illus. 7).—A revision of this monograph (E. S. R., 92, p. 564). The bibliography now includes 447 citations and the parasite-host list 93 *Trichomonas*.

Some observations on the incidence of bovine helminths in Plateau Province, Northern Nigeria, J. F. A. SPRENT (*Vet. Jour.*, 102 (1946), No. 2, pp. 36–40).—A survey of helminths of Zebu cattle examined in Northern Nigeria is described. A list is given of the species found, and the incidence of certain of the intestinal nematodes is recorded. Autopsy examination of 250 cattle failed to show any important lesions caused by helminths, but examination of the hemoglobin values of the blood of these cattle showed that the values are lower in the rainy season (May to September) than during the dry season. The anemia was shown to bear no relationship to worm infestation.

Lead poisoning of cattle, R. FENSTERMACHER, B. S. POMEROY, M. H. ROEPKE, and W. L. BOYD. (Minn. Expt. Sta.). (*Jour. Amer. Vet. Med. Assoc.*, 108 (1946), No. 826, pp. 1–4).—This discussion, based in part on the diagnosis of 11 cases, indicated that lead poisoning of cattle and especially of calves occurs more frequently than reports would indicate. The painting of calf pens with paint containing white lead and access to discarded paint residues are frequently responsible. Analyses of bovine livers are included as made by a modification of the dithiazone method of Bambach and Burkey,² which is described as neither a difficult nor lengthy procedure.

Scrapie: A disease of sheep.—A review of the literature, P. J. G. PLUMMER (*Canad. Jour. Compar. Med. and Vet. Sci.*, 10 (1946), No. 2, pp. 49–54, illus. 2).

Survival of nematode parasites of sheep on pasture during summer, EL R. DOLL and F. E. HULL (*Kentucky Sta. Bul.* 482 (1946), pp. 4).—These studies were planned to determine the longevity of parasitic larvae on permanent pasture when rested from grazing. The tests were made on two plots of permanent pasture measuring 10 by 20 ft., all of the surface being exposed to the sun except for shade of board fences around the plots. The herbage was Kentucky bluegrass, white clover, and wild grasses, kept clipped to a height of 2½ to 3 in. throughout the exposure period. Contamination was accomplished by scattering fresh sheep manure in pellet form over the plots. Egg counts on the feces ranged from 100 to 500 eggs per gram. About 2 gal. of pellets were scattered daily on each plot for 15 days, plot 1 being contaminated from June 1 to 15, inclusive, and plot 2 from June 16 to 30, inclusive. Animals were kept off the plots until October 1, when a test for infectivity was begun

² Indus. and Engin. Chem., Analyt. Ed., 14 (1942), No. 11, pp. 904–907.

by grazing the plots with two parasite-free lambs each. The lambs were permitted to graze for 2 weeks, removed to a bedded pen for 3 weeks, and then killed and the nematodes removed, identified, and counted.

In the viscera of the two lambs grazing on plot 1, which had an exposure period of 3½ mo., were found 2 tapeworms (*Moniesia expansa*) and 2 *Nematodirus filicollis*. No other nematodes were present in the gastrointestinal tract. From the second pair of lambs, grazing on plot 2 with an exposure period of 3 mo., 6 *N. filicollis*, 17 *Ostertagia circumcincta*, 4 *Haemonchus contortus*, and 2 *M. expansa* were recovered. Other nematodes were absent from the stomach and intestines. No lesions caused by nodular worms were found in any of the lambs, but ova of *H. contortus* and *O. circumcincta* were present in the feces of the lambs grazed on plot 2 when they were slaughtered.

"From these findings it was evident that keeping sheep off a pasture for 3 to 3½ mo. during midsummer and early fall should reduce nematode larvae on the pasture sufficiently for practical control. Combined with correct use of phenothiazine, pasture rotation should materially increase the efficiency of the parasite control program."

Efficacy of phenothiazine in the treatment of sheep for control of internal parasites. C. ELDER, O. S. CRISLER, and R. F. GENTRY (*Missouri Sta. Res. Bul.* 396 (1946), pp. 12, illus. 1).—Treating ewes once in December and once the following March with a full dose of liquid phenothiazine and every 28 days thereafter with 1.5 percent copper sulfate until the following December did not control nodular worm infestation even though at the beginning of the experiment the sheep were placed upon clean pasture. Neither did treating sheep with liquid phenothiazine every 4 weeks from December to March (giving a total of four treatments) and then giving them 1.5 percent copper sulfate every 28 days, although 1.5 percent copper sulfate solution was found very satisfactory in keeping the lambs free from *Haemonchus contortus*. However, treating sheep with liquid phenothiazine every 4 weeks from December to early April and then allowing them access to phenothiazine-salt mixture (1 part phenothiazine to 10 parts salt) was very satisfactory in controlling nodular worm infestation, and held the *H. contortus* infestation down to an average of about 19 per lamb. This method of handling did not satisfactorily control *Ostertagia*, *Nematodirus*, *Cooperia*, or tapeworms, and whipworm counts were not materially different in any of the three experiments. Average weight of the lambs was very much higher in this experiment. Phenothiazine was not found toxic to sheep either in a 1:10 phenothiazine-salt mixture or when the medicine was given as a drench every 28 days throughout the entire year, and its use has not interfered with breeding efficiency. Worm egg counts by the flotation method did not contribute any aid in this study, but are deemed useful in sheep infested with only one species of parasite or with species that can be definitely identified by microscopic examination alone.

Abortion in sheep following the administration of phenothiazine. B. L. WARWICK, R. D. TURK, and R. O. BERRY. (Tex. Expt. Sta.). (*Jour. Amer. Vet. Med. Assoc.*, 108 (1946), No. 826, pp. 41-42).—Experiences are reported which indicated that phenothiazine may be toxic to ewes during the later stages of pregnancy. The period of danger is approximately 2 to 3 weeks prior to parturition.

Studies on enzootic staphylococcal infection in lambs associated with tick-bite.—I. The nature of the disease, clinical findings, and differential diagnosis, A. McDIARMID (*Vet. Rec.*, 58 (1946), No. 10, pp. 103-104).—A specific enzootic staphylococcal infection in lambs of various breeds is described as occurring on tick-infested farms throughout Great Britain. This infection is characterized by the development of suppurative foci in different parts of the body, including the skin, musculature, tendon sheaths, joints, viscera, and meninges. In addition to the pyemic form of disease, an acute infection also occurs, the diagnosis of which can only be

made by bacteriological methods. The disease frequently coexists with other infections such as louping-ill, lamb dysentery, pulpy kidney disease, and tick-borne fever.

Infectious rhinitis in swine (bull nose), C. E. PHILLIPS (*Canad. Jour. Compar. Med. and Vet. Sci.*, 10 (1946), No. 2, pp. 33-41, illus. 6; *Fr. abs.*, p. 41).—This is a preliminary report on an outbreak of an extremely infectious atrophic rhinitis in pigs which has been spreading very rapidly in Ontario, apparently through the introduction of infected breeding stock.

The infection becomes established shortly after birth, although visible signs are not observed until 2 to 4 weeks of age. The first indication is that of sneezing, this symptom becoming more exaggerated as the pig grows older. At from 3 to 6 weeks of age the skin on the snout begins to wrinkle and the snout usually appears to bulge or thicken, the observable distortion varying according to the head type. There is a constant progressive dissolution of the softer bony structures of the nose and a variable exudate apparently not that of necrosis. The tissue changes present a convenient channel for bacterial invasion with resultant encephalitis, although this takes a rather minor toll in the early stages. The majority of the affected pigs are rough and chronically poor doers, requiring up to 12 mo. to market.

Initial experiments indicate that a filtrable factor is the primary etiological agent, but that secondary organisms play a large part in the destructiveness of the disease. The organism most consistently isolated from the nose and secondary lesions was *Corynebacterium pyogenes*.

A note on the tuberculin test applied to pigs, A. L. CLAY (*Austral. Vet. Jour.*, 21 (1945), No. 5-6, pp. 149-150).—Tests with 64 brood sows are reported.

Complement-fixing and neutralizing antibodies against Japanese B virus in the sera of Okinawan horses, H. L. HODES, L. THOMAS, and J. L. PECK (*Science*, 103 (1946), No. 2673, pp. 357-359).—An outbreak of encephalitis among the natives of Okinawa was studied with relation to the possible role of horses. Tests of sera from nine Okinawan horses showed in all cases that the sera fixed complement in the presence of Japanese B virus in a final dilution of 1:16 or greater, but all failed to fix complement to a significant degree when tested against Western equine encephalitis virus and in three cases when tested against Eastern equine encephalitis virus. Other evidence was obtained by neutralization tests that these horses had been in contact with Japanese B virus. "The nature of this contact is not known, but the results described support the idea that horses may have been of epidemiologic importance in the outbreak."

Penicillin treatment of acute equine infectious anemia, L. O. MOTT, C. D. STEIN, and J. O. HEISHMAN. (U. S. D. A.). (*Vet. Med.*, 41 (1946), No. 4, pp. 131-136, illus. 4).—An experimental acute case of infectious anemia was produced, for penicillin treatment, with a particularly virulent strain of virus which had produced acute cases in 22 exposed horses, 20 of which had died. The usual clinical symptoms of acute swamp fever were noted. Penicillin treatment was started 23 days after the horse showed evidence of infection during the third temperature reaction. Six million units were administered intramuscularly over a period of 40 hr. at an average rate of 375 units per kilogram of body weight per hour. An initial dose of 1,000,000 units was followed by injections at the rate of 500,000 units every 4 hr. There was little response to treatment, and death ensued 14 days following the last treatment.

An outbreak of salmonellosis in horses and mules, D. R. CORDY and R. W. DAVIS (*Jour. Amer. Vet. Med. Assoc.*, 108 (1946), No. 826, pp. 20-24, illus. 3).—An outbreak of eight cases which occurred in India among 300 horses and mules after sea and rail shipment from the United States is reported. Weakness, posterior incoordination, and fever were the most consistent symptoms. Severe gastroenteritis with hemorrhage and superficial necrosis of the gut mucosa was the most marked lesion. The cecum and colon were chiefly affected; the liver showed extreme fatty changes,

and the spleen was engorged with blood. *Salmonella moribificans* was isolated from the intestinal contents and urine.

Preliminary studies on the absorption and excretion of streptomycin in dogs, B. E. GRAHAM, M. J. VANDER BROOK, and M. H. KUIZENGA (*Science*, 103 (1946), No. 2673, pp. 364-365).—Streptomycin varying in potency from 100 to 500 units per milligram was administered to 14 dogs intravenously, intramuscularly, and orally in amounts of 100,000 to 420,000 units. High blood levels of streptomycin were observed after parenteral administration, and 23 to 65 percent was excreted in the urine of normal dogs. After 4 or 5 hr. only small amounts were detected in the blood. The maintenance of blood levels was no better with intramuscular than with intravenous administration. Following the oral administration of as much as 420,000 units of streptomycin, it could not be detected in the plasma, but up to 3.9 percent was recovered from the urine.

Sulfathalidine in the treatment of enteric infections of small animals, L. P. HEDEMAN. (Mich. State Col.). (*Jour. Amer. Vet. Med. Assoc.*, 108 (1946), No. 827, pp. 89-91).—Response to sulfathalidine therapy is reported in 10 cases of canine enteritis and 4 cases of feline enteritis. In 1 case each of canine coccidiosis and feline panleukopenia, the results were less promising.

The normal blood count of the domestic cat, W. H. RISER (*North Amer. Vet.*, 27 (1946), No. 2, pp. 93-98, illus. 7).—Blood counts for 20 cats and 5 kittens are tabulated and discussed.

Ablation of the scent glands of skunks, R. K. ENDERS and E. M. PAXSON (*Jour. Amer. Vet. Med. Assoc.*, 108 (1946), No. 827, pp. 84-86, illus. 7).—A method is described as having been used with considerable success on old and young animals which is not only relatively simple but if used with care avoids noticeable odor.

Poultry diseases common to farm flocks, R. CONNELL (*Canad. Jour. Compar. Med. and Vet. Sci.*, 10 (1946), No. 2, pp. 42-48).—This account deals especially with pullorum disease, tuberculosis, nutritional diseases, and respiratory diseases.

Studies on nutrition and avian malaria, III, IV, A. O. SEELER and W. H. OTT (*Jour. Infect. Diseases*, 77 (1945), Nos. 1, pp. 82-84; 3, pp. 181-184, illus. 1).—In part 3, Deficiency of "Folic Acid" and Other Unidentified Factors, *Plasmodium lophurae* infections were more severe, as judged by the parasite counts, in chicks deficient in folic acid and other unidentified factors than in chicks on an adequate diet. Continued passage of *P. lophurae* through chicks deficient in folic acid and other unidentified factors did not increase the severity of the infection beyond that reached in the initial transfer to the deficient host. Transfer of a *P. lophurae* strain to adequately nourished chicks after 13 passages through birds deficient in folic acid and other unidentified factors did not produce a disease that was more severe than that observed in infected chicks on an adequate diet.

In part 4, Protein Deficiency, *Plasmodium lophurae* infections were found to be more severe in protein-deficient chicks than in chicks on a diet containing an adequate amount of protein. Not only did the parasite counts reach much higher levels in the deficient birds than in controls on a high protein diet, but the mortality due to the disease was greater in the deficient birds. The protein deficient chicks were unable to clear the parasites from their blood streams as readily as were chicks fed a diet containing ample protein.

The absorption of cinchona alkaloids in the chick and its relationship to antimalarial activity, P. B. MARSHALL (*Jour. Pharmacol. and Expt. Ther.*, 85 (1945), No. 4, pp. 299-309, illus. 2).—The work described was designed to investigate how far the absorption, red blood cell, and plasma concentrations and rates of destruction of a group of cinchona alkaloids and derivatives could be correlated with their antimalarial activity in chicks infected with *Plasmodium gallinaceum*.

Determinations of the rate of absorption from the gut, red cell concentrations, and

antimalarial activity in chicks of the four natural alkaloids of cinchona and four derivatives showed that antimalarial activity was, in most cases, correlated with rate of absorption and red cell concentrations. In three optically active pairs of alkaloids, the *d*-isomers showed a greater rate of absorption, higher red cell concentrations, and higher antimalarial activity than the *l*-isomers. The rate of "destruction" of the alkaloids by chick liver suspensions was not related to optical configuration. Cinchonine and cinchonidine, unlike the other alkaloids, were not metabolized at all. Saturation of the double bond in quinine doubled the antimalarial activity. Dihydrorniquidine, however, showed no greater activity than niquidine.

Growth of protozoa in tissue culture.—I, *Plasmodium gallinaceum*, exoerythrocytic forms, F. HAWKING (*Roy. Soc. Trop. Med. and Hyg., Trans.*, 39 (1945), No. 3, pp. 245-263, illus. 29).—A technic is described for the cultivation of the exoerythrocytic forms of *P. gallinaceum* in tissue cultures of chicken cells of the macrophagoreticulo-endothelial type. It was found that cultures may be made from the spleen, buffy coat, marrow, and many other organs. Active multiplication of the parasites occurs, and living parasites have been recovered from these cultures after 89 days. Growth occurs in the presence of penicillin, 10 units per cubic centimeter.

Chickens can be inoculated from the cultures; exoerythrocytic forms appear at an early stage of the resulting infection, which thus resembles the infection produced by sporozoites rather than that produced by trophozoites. The infection can also be passed to cultures of clean chicken tissue, but passage is difficult and uncertain. It has not been possible to infect erythrocytes from these cultures.

Cultures have been made from the spleen of a chicken inoculated intravenously with sporozoites 1 hr. previously. It has not been possible to infect cultures of chicken cells by means of sporozoites.

Attempts were made to cultivate the endoerythrocytic forms of *P. gallinaceum*. Some parasites survived for 5 days, but no satisfactory multiplication could be obtained. Survival of the parasites was greatly improved by the presence of erythrocyte extract and of glutathione.

Increased parasitemia in chicken malaria (*Plasmodium gallinaceum* and *Plasmodium lophurae*) following X-irradiation, W. H. and L. G. TALIAFERRO and E. L. SIMMONS (*Jour. Infect. Diseases*, 77 (1945), No. 2, pp. 158-176, illus. 6).—Chickens with sporozoite- or blood-induced infections of *P. gallinaceum* or with blood-induced infections of *P. lophurae* were irradiated with 500 or 600 r. (roentgens) of X-rays at intervals beginning on the day of infection and with smaller doses (100-400 r.) of X-rays about 40 days after their initial infection. Irradiation induced increased parasitemia in both avian malaras but affected different periods of the two infections. Thus, in blood- or sporozoite-induced *P. gallinaceum* infections, irradiation on the day of infection produced a higher parasitemia and a statistically significant decrease in survival time of the host; during the acute rise and crisis of infections treated with quinine to reduce their severity, it was followed by acute fatal infections; and thereafter led to malarial relapses of varying degrees. On the other hand, in blood-induced *P. lophurae* infections, irradiation on the day of infection produced severe, often fatal, infections and only slight relapses thereafter. The effectiveness of a given dose of X-rays varied with the age and susceptibility of the chicken, the species of parasite, the period of the malarial infection, and the intensity of the infection prior to and at the time of irradiation. Also, as far as tested during the developed infection of *P. gallinaceum*, single doses from 300 to 600 r. were increasingly effective, with those of 100 or 200 r. being practically ineffective. In general, two doses totaling 500 r. or more within about a week of each other had a cumulative effect, but, in general, were not equal to single doses of the same magnitude.

In vitro opsonic tests with *Plasmodium gallinaceum* and *Plasmodium lophurae*, A. ZUCKERMAN (*Jour. Infect. Diseases*, 77 (1945), No. 1, pp. 28-59, illus. 5).—An opsonic test has been developed with macrophages grown in vitro from blood agranulocytes of chickens. Red blood cells from chickens having acute initial infections with *P. gallinaceum* and *P. lophurae* served as antigens, and serums from normal, homologous immune (initial latent infection) and homologous hyperimmune (after repeated superinfection) chickens served as test serums. Complement was not essential. Circulating antibody against normal and parasitized red cells from homologous infections was demonstrated in undiluted hyperimmune serums from chickens superinfected with *P. gallinaceum* and *P. lophurae*, but was not found in immune serums from birds recovering from acute initial infections. Phagocytic indices of undiluted hyperimmune serums were two to nine times as high as the normal controls for anti-*lophurae* serums and two to four times as high as the normal controls for anti-*gallinaceum* serums. These opsonic titers were of a lower orders than those attained with antipneumococcus serum. The antibody in anti-*gallinaceum* hyperimmune serum was more efficiently absorbed by normal red cells than by an equivalent quantity of homologous parasitized red cells. *P. gallinaceum*-infected red cells were opsonized not only in vitro but in vivo under certain conditions. The phagocytic index of parasitized blood in normal serum was higher when the antigen was collected around the time of the crisis than when it was collected during the early acute rise or just after the crisis. The amount of phagocytosis in the presence of normal serum varied inversely with the amount of antigen when the latter was collected at the peak of the infection and during the immediately ensuing crisis.

Infection of chick embryos with non-pigmented forms of *Plasmodium gallinaceum*, V. H. HAAS, A. WILCOX, and F. M. EWING (*Jour. Natl. Malaria Soc.*, 4 (1945), No. 4, pp. 279-284).—Serial transmission in chick embryos of a form of *P. gallinaceum* infection characterized by predominance of exoerythrocytic forms has been carried through seven passages by inoculation of brain emulsion into yolk sacs. In addition to the predominance of exoerythrocytic forms and the low density of erythrocytic parasites, this infection has been noteworthy for the appearance of nonpigmented parasites in the red blood cells. Observations of these nonpigmented erythrocytic forms indicate that they have developed from merozoites released by exoerythrocytic schizonts, and that they are probably unable to produce pigment during their initial intraerythrocytic developmental cycle, but that they acquire this ability later. The results of this study indicate the ability of *P. gallinaceum* to survive indefinite serial transmission in chick embryos with negligible invasion of the erythrocytes and without manifesting that type of metabolism of hemoglobin which results in the production of malaria pigment.

Immunological relationships of *Plasmodium gallinaceum* and *Plasmodium lophurae*, W. H. and L. G. TALIAFERRO (*Jour. Infect. Diseases*, 77 (1945), No. 3, pp. 224-248, illus. 12).—Chickens immune (3-5 or 7-8 weeks after initial infection) or hyperimmune (following repeated superinfections) to *P. gallinaceum* and to *P. lophurae*, respectively, were tested for their homologous and heterologous immunity to these two species by reinjecting them intravenously with large numbers of plasmodia and ascertaining the time of the disappearance of the plasmodia from the blood. *P. gallinaceum* gave a marked homologous and heterologous immunity, whereas *P. lophurae* gave a marked homologous but only a slight, if any, heterologous immunity. These immunities were stronger after 8 weeks in chickens infected with *P. gallinaceum* and after 4 to 5 weeks in chickens infected with *P. lophurae*. Hyperimmunization by repeated superinfections fortified the immunity against *P. lophurae* but not against *P. gallinaceum*. These differences seemed to be correlated, in part, with the amount and spacing of the hyperimmunizing doses and,

in part, with the fact that immunity to *P. gallinaceum* increases over a considerable period whereas immunity to *P. lophurae* diminishes more or less rapidly. Erythrocytic stages and sporozoites of both parasites were used for immunization, and erythrocytic stages and sporozoites of *P. gallinaceum* and erythrocytic stages (no sporozoites) of *P. lophurae* were used for the test injections. These stages reacted essentially similarly as measured by the parasitemia, and any differences seemed to be due to differences in the quantity of antigen absorbed by the chicken.

Continuous intravenous chemotherapy of Plasmodium lophurae infection in ducks. A. C. BRATTON, JR. (*Jour. Pharmacol. and Expt. Ther.*, 85 (1945), No. 2, pp. 103-110, illus. 1).—A method incorporating a simple rotary injection pump is described for continuous intravenous administration of drugs to ducks infected with *P. lophurae*. On the basis of dosage, quinine was more effective at the level of minimum therapeutic response when given intravenously in single daily doses than when given by continuous infusion; at a high level of response, the converse was true. At the level of minimum response, cinchonine was equally effective when given in single daily intravenous doses or continuously. Tartar emetic, sodium antimony thioglycollate, and mapharsen were effective in doses at or near the toxic level. Penicillin, streptomycin, and quinine were inactive in the doses employed.

The results suggest that quinine, quinacrine, and pamaquine each possess a different principal mechanism of drug action against *P. lophurae* in the duck.

Cannibalism in chickens (*Wash. State Col. Ext. Bul.* 334 (1946), pp. 4).—The causes of this condition and its prevention and control are discussed.

On the chemotherapy of caecal coccidiosis (*Eimeria tenella*) of chickens.—II, Further studies on the use of drugs in established infections, W. E. SWALES (*Canad. Jour. Compar. Med. and Vet. Sci.*, 10 (1946), No. 1, pp. 3-13, illus. 1).—Experiments on the chemotherapy of caecal coccidiosis of chicks have supported previous findings^{*} that sulfamerazine (2-sulfanilamido-4-methylpyrimidine) and its sodium salt are strongly coccidiostatic and will check the disease when administered soon after bleeding from the intestine has commenced. The dimethyl and the unmethylated counterparts, sulfamezathine and sulfadiazine, are likewise coccidiostatic, but limited experiments have indicated that the fully methylated drug 2-sulfanilamido-4,5,6-trimethylpyrimidine and the 2-sulfanilamido-4,5-dimethylpyrimidine are inactive. Other chemicals, related only through the pyrimidine structure, did not show any indication of a coccidiostatic effect or of relationship to the activity of the parasite. Studies on dosage and period of treatment showed that 2 gm. of 2-sulfanilamido-4-methylpyrimidine per pound of feed or 2 gm. of its sodium salt per liter of drinking water should be used for 3 days, commencing as soon as bloody droppings appear, if optimum results are to be obtained from the use of this drug. A commercial preparation was found to have equal efficiency as long as dosage was increased to counteract dilution of the 2-sulfanilamido-4-methylpyrimidine by other ingredients. Measurements of the blood hemoglobin levels of infected chicks served as a valuable indicator of the extent of the disease and of the action of drugs. No toxic effects from the use of the active drugs in the dosages indicated were apparent.

Sodium sulfamerazine in the treatment of cecal coccidiosis. P. A. HAWKINS and R. RAUSCH. (*Mich. Expt. Sta.*). (*Poultry Sci.*, 25 (1946), No. 2, pp. 184-185).—Tests with 6-week-old White Leghorn chicks indicated that the soluble sodium salt of sulfamerazine in the drinking water is very effective in both the control and the treatment of *Eimeria tenella* infections. All birds consuming enough of the drug to reach the 5 to 6 mg. percent level previously found necessary with sulfamethazine (E. S. R., 93, p. 625) survived. No untoward results as manifested by weight changes were noted, and no gross pathological change other than a slight distension of the uriniferous tubules with a whitish substance, possibly urates.

^{*} *Canad. Jour. Res.*, 22 (1944), No. 6, Sect. D, pp. 131-140.

Prophylactic vaccination against infectious laryngo-tracheitis, T. L. FURNESS (*Austral. Vet. Jour.*, 21 (1945), No. 5-6, pp. 142-146).—Experiences in New South Wales are reported showing that from 1940 to 1944, 950,000 cockerels and pullets between the ages of 8 and 20 weeks were vaccinated, with results in the main entirely satisfactory. In none of these did laryngo-tracheitis occur as a direct result of vaccination. In some cases, however, a temporary bilateral paralysis was noted.

The occurrence and distribution of *Salmonella* types in fowl.—I, Isolation from hens' eggs, F. E. CHASE and M. L. WRIGHT (*Canad. Jour. Res.*, 24 (1946), No. 1, Sect. F, pp. 77-80).—Using selective media, an examination of 2,400 hen's eggs was made to determine the incidence of *Salmonella* types in the egg or on the shell. The contents of 1,000 eggs laid by a flock of presumably normal hens did not yield any representative of the *Salmonella* group. Of a similar number of eggs produced by a flock of 55 known pullorum reactors, 61 were found to contain *S. pullorum*; no other *Salmonella* organisms were isolated. The exteriors of an additional 400 eggs obtained from the latter source failed to produce any *Salmonella* types.

A note on artificially infected fowl as carriers of *Salmonella*, N. E. GIBBONS and R. L. MOORE (*Poultry Sci.*, 25 (1946), No. 2, pp. 115-118).—Following the authors' finding of *Salmonella* types in Canadian dried egg powder (E. S. R., 92, p. 730), the present study was undertaken to elicit some information on how long infected chickens carry the organisms and whether the organisms could be isolated from many of the eggs of infected birds.

Six Barred Rocks, approximately 18 mo. old, five of them pullorum positive, were observed over a period of 37 days before making any tests. Aqueous suspensions of *S. bareilly* were then fed, and the organisms were eliminated from the intestinal tract in 2 to 4 days. When broth cultures were fed, the organisms were excreted over periods of 18 to 38 days. Autopsies of a few birds which were excreting *S. bareilly* indicated that "in adult fowl the organisms apparently localize in the intestinal tract. It is therefore quite possible that eggs may be contaminated through fecal matter. In these experiments *S. bareilly* was isolated from the shells of 3 of 37 eggs laid while this organism was being excreted."

Outbreak of gastroenteritis—*Salmonella pullorum*, R. B. MITCHELL, F. C. GARLOCK, and R. H. BROH-KAHN ([U. S.] *Off. Surg. Gen.*, U. S. Army Med. Dept. Bul., 5 (1946), No. 3, pp. 248-250).—An extensive outbreak of gastroenteritis at an Army air base in Texas is ascribed to *S. pullorum* from eggs combined with other ingredients in a rice pudding. Cultures of *S. pullorum* were isolated from 11.7 percent of the hospitalized patients and *S. derby* from 0.6 percent.

Bacteriological examination of shells and contents of eggs laid by turkeys naturally or artificially infected with *Salmonella typhimurium*, H. C. GAUGER and R. E. GREAVES. (N. C. Expt. Sta.). (*Poultry Sci.*, 25 (1946), No. 2, pp. 119-123).—*S. typhimurium* was not recovered from the contents of 164 eggs laid by 6 turkey hens with natural *S. typhimurium* infection. Thirty-four of the 164 eggs were laid by 1 bird, proved infected at autopsy by recovery of *S. typhimurium* from blighted ova.

A total of 184 eggs laid by 12 turkey hens artificially infected with *S. typhimurium* were cultured. Of 117 eggs in which both the shell and contents were cultured, 27 had infected shells and 6 had infected shells as well as infected contents. In 15 eggs in which only the contents were cultured, none had infected contents. In 52 eggs in which only the shells were cultured, 5 had infected shells. At autopsy *S. typhimurium* was recovered from one or more sites in 8 of the 12 hens.

Experimental edema and ascites in poults, L. H. SCRIVNER (*Jour. Amer. Vet. Med. Assoc.*, 108 (1946), No. 826, pp. 27-32).—Experiments to determine the cause of this disease are reported in which the effect of sodium bicarbonate, carbonate,

citrate, iodide, hydroxide, and sulfate and of carbonated water was studied. It was found that sodium chloride and bicarbonate, when administered to poult in proper proportions in feed or water, will produce the disease, and that other sodium compounds may also do so provided the effective level is not so unpalatable as to prevent consumption. All the sodium compounds tested appeared to be lethal at comparatively low intake levels, and it also appeared to be possible that formaldehyde fumigation, which was also tested, could be a cause. It is suggested that investigations should be made of the sodium intake of poult flocks from which losses are reported from edema and ascites.

Nicotinic acid deficiency in turkey poult and the occurrence of perosis, G. M. BRIGGS. (Md. Expt. Sta.). (*Jour. Nutr.*, 31 (1946), No. 1, pp. 79-84, illus. 1).—Turkey poult fed a highly purified diet containing all necessary nutrients except nicotinic acid grew poorly and developed certain deficiency symptoms such as inflammation of the mouth, diarrhea, low feed consumption, poor efficiency of feed utilization, poor feathering, and perosis. The perosis in the deficient birds occurred in spite of ample manganese, choline, and biotin in the diet. All symptoms were prevented by the addition of 3 to 5 mg. of nicotinic acid per 100 gm. of ration, but it is thought that higher levels may be needed for optimum growth.

Duck disease at Tulare Lake, D. D. McLEAN (*Calif. Fish and Game*, 32 (1946), No. 2, pp. 71-80, illus. 2).—An outbreak caused by the toxin of *Clostridium botulinum* type C is described. This outbreak started in the Tulare Lake area in 1938 after the heavy runoff floods of that spring and summer. It continued each late summer and fall through the years following until 1945, when little or no disease was in evidence. The outbreak was associated with irrigation procedures whereby post-harvest flooding and slow withdrawals of water resulted in extensive decomposition of vegetable and animal matter. Changes in the methods in 1942 whereby standing water was avoided are credited with the subsequent reduction of the disease.

AGRICULTURAL ENGINEERING

Training agricultural engineers to meet today's challenge, G. B. NUTT. (Clemson Agr. Col.). (*Agr. Engin.*, 27 (1946), No. 3, pp. 112, 130, 133).—This is a general discussion of the largely increasing demand for graduates in agricultural engineering, the need for improved teaching facilities in this department at many institutions, the desirability of more practical training in the teaching of this subject, the need for more opportunities for graduate work in agricultural engineering, "a critical need" for textbooks of a more technical character, etc.

[Agricultural engineering studies in Colorado] (*Colo. Farm Bul. [Colorado Sta.]*, 7 (1945), No. 6, pp. 2-4, 6, illus. 2).—Brief reports are made entitled Sugar Beet Growers Look to Mechanical Harvesters to Solve Labor Problems, by E. M. Mervine and R. T. Burdick (pp. 2-4); and Mechanical Post-Hole Digger Digs Hole 30 Inches Deep in 40 Seconds (p. 6).

A practical and inexpensive irrigation headgate frame that is easy to make, W. P. KINTZLEY (*Colo. Farm Bul. [Colorado Sta.]*, 7 (1945), No. 5, pp. 8-9, illus. 2).—The sides of the frame consist of two lengths of 2 in. by $\frac{3}{4}$ in. angle iron welded at top and bottom to two pieces of $2\frac{1}{2}$ in. strap iron. Four burs are welded to the inside of the outward-turned fin of each of the side pieces and far enough out to permit free vertical movement of the gate. Eight bolts are welded to the back of the frame to project into the concrete into which the frame is to be set. A catch to hold the gate at any desired degree of opening consists of a short piece of strap iron pivoted upon a single bolt attaching it to the outer face of the gate near one edge, over which it projects just enough so that it will press against the side

angle iron and will not pass over center. As illustrated, the frame is for a bell tile 15 to 18 in. in diameter, but it may be made in any size. The frame should be made to the measure of the tile bell, and may then be placed against a tile 3 in. larger without retarding water flow.

Slash disposal on the Colville Indian Reservation, H. WEAVER (*Jour. Forestry*, 44 (1946), No. 2, pp. 81-88, illus. 5).—Because of risk of damage to remaining trees "there has had to be a constant compromise between cost and proper insurance against fire." Mechanical piling with equipment somewhat similar to that described in the succeeding article, together with spot burning controlled by methods here carefully detailed, was found to give much better fire protection and to permit better forestry than did hand piling.

Development and use of Forest Service slashbuncher teeth, L. L. COLVILL (U. S. D. A.). (*Jour. Forestry*, 44 (1946), No. 2, pp. 89-91, illus. 1).—Slash bunching by means of a commercial rock blade attached to a caterpillar tractor was not generally found preferable to hand bunching when first tried but came into use when hand labor ceased to be available. It required various additions to the tractor for the protection of machine and operator. An attachment of the buckrake type to be used on a bulldozer could not be made universal because of wide variations in the frames of these machines. Removable teeth fitted to the conventional bulldozer blade (a device attributed to W. L. McDonald, equipment engineer, U. S. D. A. Forest Service) furnished the practical solution. In the design adopted, the teeth for a 30-40 size tractor are of mild steel, 1.5 in. thick, 4 in. wide at the bottom tapering to 2 in. at the top, and 5 ft. long. They extend 20.75 in. above the top of the bulldozer blade to provide protection for the radiator, and approximately 6 in. below the cutting edge of the blade to allow room for dirt to sift through. Each tooth is shaped to fit the curve of the blade. A shoe 4 in. wide and 9 in. long, rounded in front and tapered behind, is welded to the bottom of the tooth to keep it from digging into the ground. The cutting edge of the blade rests in a clip welded to the tooth at the desired distance above the ground. A set screw slightly above the top of the blade serves to draw the tooth tightly against the blade vertically. An anchor block is welded to the top and back side of the blade to hold a "U" bolt which serves to pull the tooth snugly against the blade. Two small blocks are welded near the bottom of the blade on each side. A web is welded in the bend of the tooth to add strength. Four teeth make a set. The two end teeth are fastened to the blade a few inches from the ends, and the other two are located to equalize the remaining distance.

In practical use it was found that "an inexperienced operator can do irreparable damage to the residual stand and run up the cost in excess of piling by hand, whereas an experienced tractor operator can, in most cases, lower the cost and do far better work than can be done with hand labor. The job will be better because with machinery it is possible to include the large fuels such as pitch tops, down snags, cull logs, and large limbs not possible to pile by hand." Cost of the operation varied from \$8 to \$14 per acre. Some tractor bunching was contracted at from \$10 to \$10.50, as compared with hand work under like conditions contracted at from \$14 to \$15 per acre and limited to material less than about 4 in. in diameter.

Farm power, J. B. DAVIDSON. (Iowa State Col.). (*Agr. Engin.*, 27 (1946), No. 3, pp. 131-133, illus. 3).—The author outlines the development of the use of power for farm work from the stage of almost purely hand labor, still existent in 1776, to the present average use of about 10 hp. of motor capacity "for each person gainfully employed in agriculture." Comparing this available power with the average output of 0.1 hp. by a man in good physical condition during an 8-hr. day and with the farm labor power available in the slave labor era, he notes that "each worker has the equivalent of 100 slaves to aid him. This is about the number wealthy slave holders had in the time of the Revolution."

With reference to probable future developments, the author notes general agreement among engineers that much of the advantage of the light weight of the internal combustion engine in proportion to available power is lost in the practice of weighting the tractor to give traction. Self-propelled machines avoid this waste. There is need also of a variable-weight tractor, provided with "a ready and conventional means of changing weight as needed." The need for variability of power output by variation of motor speed is also pointed out. "At the present time farm engines must be operated at the most desirable speed for the heavy power tasks, and are thus operated very inefficiently at light loads. A variable-speed motor operating, say, at a speed of 1,600 r. p. m. when 40 hp. is required, and at only 400 r. p. m. when 10 hp. is needed, would not only make for economy of fuel consumption but would extend the life of the engine." It is concluded that "the changes in the application of power to farm operations in the years ahead may be the most significant of those of all time."

Preliminary report on ear corn drying, F. D. YUNG (*Nebraska Sta., Agr. Engin. Prog. Rpt. 14* (1946), pp. 4, illus. 2).—Experiments on corn drying by forced draught ventilation and on drying at temperatures of from 200° to 300° F. are described. In a round wire crib with raised floor, shelling trench, and slatted vertical central ventilator, about 1,000 bu. of ear corn of 26 percent average moisture content when cribbed were dried in about 2 weeks by the use of a 24-in. double-inlet centrifugal fan to an average moisture content of 16.37 percent, the air having been driven into one end of the shelling trench, of which the other end was blocked. Heat from a weed burner was used during 12.5 hr. to raise the temperature of the air input to about 25° above that of the outdoor air. Detailed operational data from this experiment are given.

In the heated air drying experiments, drying temperatures from 190° to 200° cause no damage visible in the ear corn, but shelling showed the germ ends of the kernels shriveled, somewhat brittle, and discolored. Similarly, rapid drying at air temperatures of about 300° caused discoloration visible in the ear corn, numerous heat-damaged kernels being found in the shelled corn. The hot-air dried corn was not significantly different from that dried at room temperature with regard to carotene and amide nitrogen content. Comparative feeding experiments (white rats) gave somewhat inconclusive results as to any effects upon nutritional value.

A forced ventilation hay drier, A. T. HENDRIX. (U. S. D. A. coop. Va. Expt. Sta.). (*Agr. Engin.*, 27 (1946), No. 3, pp. 113-116, 120, illus. 7).—The author reports upon the design principles, construction, and performance of a drier of the central duct and slatted floor type having some features not hitherto in general use. The system is of relatively simple construction, does not require high quality or dressed lumber, and was found to provide good air distribution with low pressure loss in the system. Performance and results have been very satisfactory in the experimental trial under an initial 14-ft. depth of hay, about 5/6 alfalfa, the remainder being soybean hay added on top. The quality of the hay produced, though not graded officially, was considered excellent.

Factors controlling the rate of moisture removal in barn hay-curing systems, C. E. FRUDDEN (*Agr. Engin.*, 27 (1946), No. 3, pp. 109-111, illus. 7).—Observations and deductions here discussed led to the following conclusions:

To ensure production of hay free from mold, the drying rate must be such that the moisture content of all damp hay will be reduced to 10 percent within 7 days after it is placed in the mow. The rate of moisture removal is governed by the temperature and humidity ("condition") and by the quantity of the air passing through the drying zone. The air delivered by the fan is not all effective for drying, since there is a leakage loss through paths offering an air-flow resistance less than that of the drying zone. This leakage loss was found to be least when the

mow walls are smooth and airtight and the hay next to the walls carefully tramped, chopped hay offering a drying zone air-flow resistance greater than that of long hay. An increasing proportion of leakage loss with increasing depth of the hay was found to limit the successful application of floor duct systems, the air pressure required being increased or the volume delivered decreased with increasing depths of hay. These factors may reduce the drying rate at a 20-ft. level to not more than one-third of that attained in hay 5 ft. deep. An illustration shows a portable engine blower described as delivering 20,000 c. f. m. against 1.5 in. static pressure and arranged to utilize waste heat from the engine to warm the air input.

Calculating fan, motor, and duct requirements, G. R. SHIER (*Agr. Engin.*, 27 (1946), No. 3, pp. 121-122).—Although he finds each installation an individual problem, the author feels that some parts of the mow hay-curing system may be standardized. Particular stress is laid upon the bearings, which must ensure that the fan will operate at full load continuously and without failure for two or more weeks after lying idle during winter and spring. Bearings "of the highest quality." sealed against loss of lubricant or entrance of air, are held to be required. As a good "rule of thumb" for fan selection, the author proposes that the readily measured fan outlet should provide at least 1 sq. ft. for each 2,500 c. f. m. at $\frac{1}{2}$ -in. static pressure and at least 1 sq. ft. for each 2,000 c. f. m. at 1-in. static pressure. More air can be forced through fans than this would indicate, but it usually requires excessive power. Somewhat slower outlet velocities are usually more efficient in the use of power. To avoid the cost of special V-belt pulleys, motors having shafts larger than $1\frac{1}{8}$ in. should not be selected. Because of limited power capacity often encountered in rural service lines, motors capable of being brought up to speed at low voltages are to be desired.

Air duct design is dealt with in somewhat less detail, emphasis being given especially to designing in accordance with detailed knowledge of the given mow and with the method to be used in placing and removing the hay. In connection with design of the lateral system, either inverted trough or slatted floor, compensating for unequal air resistance in the hay load is given first consideration. Subfloor distribution is held to be of little present importance.

Factors affecting the nutritional value of forage plants, H. A. MACDONALD. (Cornell Univ.). (*Agr. Engin.*, 27 (1946), No. 3, pp. 117-120, illus. 1).—The factors referred to are those involved in the cutting, curing, handling, and storage of grass, leguminous, and mixed hays. The points considered in the quality grading of hay, though related to its nutritional value, are held to serve only as a general guide, nutritional value being more accurately measurable by digestibility and by protein, carbohydrate, mineral, and vitamin content. Although legumes are usually of a nutritive value higher than that of grasses, the yield of most perennial herbage plants increases rapidly during the early stages of growth, is fairly constant during the flowering period, and declines thereafter. In the case of annual and biennial plants the decline following flowering is much less marked. Nutritional values discussed in relation to mechanical and timing factors in haymaking include carotene content, leaf loss, difficulties in either field or barn curing introduced by the matting of succulent forage upon wilting, dry matter losses due to heating in storage, which are shown to affect first and most largely the components of the most nutritional value (proteins, carbohydrates, and vitamins) even when the heating falls considerably short of spontaneous combustion temperatures, leaching losses occurring upon exposure of partially or fully cured hay to wetting, losses caused by cell respiration after cutting, etc. Numerous data, tabulated or cited in the text, are brought together to show the importance of the factors considered.

"The difficulty of curing hay plants at their most nutritious stage of growth, without excessive loss, and the problem of maintaining their high nutritional value during

handling and storage is one of the greatest problems facing us today in the field of forage production. It would seem therefore that, at the present time, greater advances can be made in this field through the development of improved ways and methods of handling forage efficiently than by any other means."

Water for the modern farmstead (*U. S. Dept. Agr., 1946, AIS-44, pp. 4, several illus.*).—A layout design taking water to every point in the house and farmstead where it is needed is shown in a diagrammatic drawing, overhead irrigation being included both in the lay-out drawing and in the statement of data upon which to base total requirements of a water system "easily adaptable to most modern farmsteads." The type of pump needed and its protection from freezing are briefly dealt with, a capacity of 350 gal. per hour and a 42-gal. storage tank being mentioned as generally minimal for average farm use. Pipe sizes are indicated only in the general caution to "be sure that all pipes are large enough" to avoid inconvenience or such injuries as scalding of a bather by the turning on of the cold water at another point in the circuit.

Electrical heating of water for livestock, J. B. DOBIE (*Washington Sta. Bul. 182 (1945), pp. 11, illus. 4*).—Various methods of using electric light globes as a source of heat warmed the water satisfactorily but proved impracticable in other ways.

Hotbed-warming cable covered with deproteinized rubber was successful and practical in a number of experiments here reported, both those carried out in a refrigerator room kept at a temperature of from 6° to 8° F. and those made in actual working conditions under which temperatures near 0° were satisfactorily met. In the refrigerator experiments, water in a shiplap box 30 in. square and 24 in. deep immersed in a metal stock watering tank was maintained at 60° by the continuous operation of two 200-w. hotbed cable units. With the use of a thermostat set at 50°, current consumption was 276 watts; at 40°, 208 w. In outdoor trials at two locations in successive winters, a thermostat setting of 36° was used, and was sufficient to prevent formation of more than a surface film of ice at any time. The first of these outdoor tests required a total of 406 kw.-hr. from December 20 to March 15; the second, 435 kw.-hr. from Dec. 26 to March 25.

Under the head of recommendations, precautions necessary to avoid risk of shorts, shocks, and fire hazards are emphasized. A bill of materials with approximate costs is appended.

Planning your farmstead wiring and lighting (*U. S. Dept. Agr., Misc. Pub. 597 (1946), pp. 31, several illus.*).—This publication is intended as a guide to the correct placement of an adequate number and type of lighting fixtures, other outlets, and switches in typical farmhouse rooms, closets, halls and stairways, and porches; yard light systems; and such work buildings as the pump house, barn, milk house, hen house and brooder, hog house, and farm shops. Many of the conventional symbols used in wiring plans are explained and are used in the drawings indicating probable needs in rooms and work spaces. The wiring itself is regarded as a technical job, to be left to the wiring contractor. Only such technicalities as need to be understood for planning an efficient system are here discussed.

The needs of a farm structures program, D. G. CARTER. (Univ. Ill.). (*Agr. Engin., 27 (1946), No. 3, pp. 123-124*).—Points especially considered in this general discussion are: (1) A more adequate concept of the need for and functions of farm structures; (2) offsetting existing deficiencies; (3) farm dwelling improvement; (4) farmstead organization for efficiency, health, and enjoyment; (5) definition of functional requirements; (6) farm structures research; (7) extension education; (8) training of personnel; (9) planning services; and (10) coordinating and integrating industry and public service activity.

A small rigid summer shelter, L. M. BLACK (*New Jersey Stas. Hints to Poultrymen, 32 (1945), No. 4, pp. 4, illus. 1*).—Detailed plans with a bill of materials for the

construction of a rigid type of summer shelter to house 90 growing pullets to maturity are presented. The author states that among the principal advantages for the small type unit are that it is more practical than the collapsible type of shelter, can be economically constructed, will promote health in the birds assigned to it, and will tend to prolong the life of crops on the range area. With a little planning an attendant can take care of a great many birds distributed in these smaller type structures, and the percentage of good pullets that will be harvested from them will undoubtedly exceed the percentage that will result if larger, more cumbersome shelters are provided.

Electric ventilation of poultry houses, G. W. KABLE (*Agr. Engin.*, 27 (1946), No. 2, pp. 61-66, illus. 8).—The author reviews the present engineering design recommendations and developments in electric ventilation for poultry housing. He points out the need for more basic and fundamental functional data to aid in overall designs and lists the following items as suggested investigational challenges to research: (1) At just what threshold temperature or difference in inside and outside temperatures is the health and production of a hen hazarded; (2) what is the actual heat and moisture production of hens of different breeds, ages, and weights under different environmental conditions; (3) what is the critical relative humidity to preserve health and production under flock conditions; (4) how much water must be evaporated from droppings and removed by ventilation to keep litter in usable condition; (5) why does litter keep drier the second year than the first year of use; (6) can a figure be determined for the cubic feet per minute per bird which must be removed by ventilation in the different housing zones and for different size hens; (7) we need more data on the heat retained in buildings and in the ground that is available as a supplement to the heat produced by the hens; (8) additional studies are needed on number, types, and spacing of intakes, bearing in mind that the cost should be kept low and windows used, if possible; (9) the effect of recirculation in providing higher temperatures at floor or roost level and other desirable conditions merits further study; (10) studies should be made of actual suction pressures developed within typical insulated and uninsulated houses when exhausting 1 to 4 c. f. m. of air per hen to learn the actual pressures against which fans must operate; (11) special poultry house ventilation fans need to be made available with nonoverloading and noncorroding blades that are easy to keep clean, reasonably low in cost, and driven by fire-safe motors capable of operating continuously for 5-mo. periods with little attention; and (12) should air volumes be controlled at low temperature peaks by manual control of intakes or outtake dampers, or by automatic thermostats or solenoids.

In summing up the over-all ventilation problem the author states that sufficient information is available to warrant the installation of electric ventilation systems in poultry houses. They should be watched, however, and studied for possible improvements in design and operation. Suitable fans are needed at prices which will permit rugged construction and carefree operation without making the ventilation cost prohibitive. It must be decided whether the most important consideration in ventilation is dry litter, dry walls, unfrozen water, the poultryman's comfort, etc., and design for that purpose. Research work on the effect of ventilation on hens should be extended.

Electric ventilation is justified only if it does a better job or does it cheaper or more reliably than other systems of ventilation. Ventilation is only one factor in poultry management. It must be considered in connection with building insulation, feeding, labor requirements, and other management problems, and not as an end in itself.

The application of mechanical refrigeration to ranch egg cooling, F. W. LORENZ. (Calif. Expt. Sta.). (*Agr. Engin.*, 27 (1946), No. 2, pp. 69-73, illus.

5).—Studies made on the rate of temperature loss from eggs enabled the development of a general expression relating cooling rate to air velocity under various conditions. It was found that rapid cooling minimized moisture loss from eggs and albumen quality was not affected by the cooling rate within wide limits. Tests of a specially designed experimental refrigerated egg-cooling cabinet, suitable for use on a poultry ranch of moderate size and operated at a temperature of 55° F., gave appreciable improvements in egg quality over the quality of eggs cooled and held in an evaporative cooler egg room. Of those eggs tested, the difference reported in grade represented an extra 2.8 doz. of grade AA eggs per case of eggs cooled in the refrigerated cooler. Had the comparison been made with eggs held in the feed house (as they are on many ranches), the differences would have been more striking. During one 3-week period in August and September, 555 doz. eggs were cooled in the experimental cooler and 1,173 doz. were held in the egg room. At the prevailing prices an additional income of \$7.61 was obtained from the eggs cooled in the experimental unit, with a total power cost of operation during the test period of only \$1.81.

A water cooled egg storage cabinet, F. D. YUNG (*Nebraska Sta., Agr. Engin. Prog. Rpt. 13* (1946), pp. 3, illus. 3).—This cooler consists of an insulated cabinet provided with a fin and tube cooling coil through which air is drawn by an electric fan and circulated through the cabinet. In baskets, the eggs nearest the fan were cooled quickly, the remainder not sufficiently rapidly. In mesh-bottomed pails set over holes slightly smaller than the bottoms of the pails and cut through the floor of the cooling compartment, the eggs were cooled with uniform rapidity, well water at about 57° F. in the cooling coil maintaining an egg temperature of from 60° to 65° in an ambient air temperature as high as 110° and preserving the eggs in good marketable condition for a week. The cabinet as shown contains a storage compartment in addition to the initial-cooling section with two floor holes for mesh-bottomed pails. The high humidity needed for satisfactory storage of eggs was maintained by means of wet sand placed in the bottom of the cabinet.

AGRICULTURAL ECONOMICS

Farm production in war and peace, G. T. BARTON and M. R. COOPER (*U. S. Dept. Agr., Bur. Agr. Econ., 1945, F. M. 53, pp. 85+, illus. 19*).—Wartime and prewar changes in farm production and production per worker are measured and analyzed through the use of two recently developed indexes—gross farm production and farm output. The methods used in constructing the new indexes are described. They “supplement in two important respects the Bureau of Agricultural Economics index of volume of agricultural production for sale and home consumption which has been published since 1928. The gross-farm-production index includes farm-produced power of horses and mules as an item of farm production, whereas the production-for-sale-and-consumption index does not. The production-for-sale-and-consumption index is available for the United States only, but the farm-output and gross-farm-production indexes have been constructed for each of the nine census geographic divisions as well as for the United States, thus making possible an analysis of important geographical changes in farm production. All three of these index series are needed in order to analyze farm-production changes adequately.” Other sections of the report describe, analyze, and discuss war and prewar gross farm production and output, the changes in composition and wartime increases in gross farm production, the factors responsible for wartime increases in farm output, wartime and peacetime farm employment and gross production and output, size and nature of the wartime farm labor job, how farm workers did the wartime production job, and after the war. The two new indexes, the production-for-sale-

and-consumption index, and the Works Projects Administration indexes of agricultural production and output per worker are compared. The index of crop production per acre used in the present report and the crop-yield index of 28 crops, published by the Bureau of Agricultural Economics, are also compared.

Feed grains and meat animals in war and peace, C. W. CRICKMAN (*U. S. Dept. Agr., Bur. Agr. Econ., 1945, F. M. 51, pp. 55+, illus. 23*).—"The purpose of this report is to trace the developments in production and consumption of feed grains, meat animals, and meat during the two World Wars and intervening years, and to explore the circumstances which may influence the course of changes during the early postwar period." Tables and charts are included and discussed, showing the changes since 1910 in the acreage and production of corn, oats, barley, and sorghums; total feed consumption; hog production; numbers of beef cattle, sheep, and lambs; and prices of meat animals and feeds. Wartime changes in feed grains and meat production and consumption are discussed. Other sections deal with the situation in the near future and longer-time postwar prospects.

Agricultural land ownership and operation in the southern San Joaquin Valley, E. E. WILSON and M. CLAWSON (*U. S. Dept. Agr., Bur. Agr. Econ., 1945, pp. 100+, illus. 16*).—"Presented here is a brief historical statement of the major events in the disposal of public land in the San Joaquin Valley and the subsequent settlement, ownership, and operation of land up to 1940. The major part of the report is devoted to presenting factual information on landownership and land operation in the agricultural portions of Madera, Tulare, and Kern Counties. Some consideration is given to the effect of the present Reclamation law and of possible modification in this law upon the pattern of landownership and land operation which might be expected to develop after the Central Valley Project is completed."

Economic land classification of Fluvanna County, G. W. PATTESON and F. V. SHELTON (*Virginia Sta. Bul. 371 (1945), pp. 9, illus. 1*).—"The primary object involved in the preparation of the economic land-classification maps and reports of Virginia counties is to designate those areas of land which are not adapted to farming from those which are suitable for agricultural production. This delineation of the submarginal land from the marginal or better agricultural land is necessary to the development of a land utilization program in the State." General descriptions are included of the county and of the purpose of economic land classification. The agricultural trends, economic soil groups, and the agricultural and land potentialities of the county are discussed. The land classes are defined. A map of the county, accompanying the bulletin, shows the areas in different land classes and the types of roads and buildings. Tables show the percentages of lands in different land classes; by census periods, 1879-1940, the land in farms, acreages in important crops, and numbers of different kinds of livestock; the value of farm products sold, traded, or used by farm households in 1939, and the variation in total value; and the classification of farms by major source of income.

[Economic land classification in Virginia counties] (*Virginia Sta. Buls. 372 (1945), pp. 10, illus. 1; 376, pp. 7, illus. 1; 379, pp. 7, illus. 1; 385, pp. 9, illus. 1*).—These bulletins continue the series noted above. The counties included are: Bulletin 372, Greene County, by G. W. Patteson and F. V. Shelton; Bulletin 376, Shenandoah County, by G. W. Patteson and S. C. Shull; Bulletin 379, Culpeper County, by G. W. Patteson and A. J. Harris; and Bulletin 385, Botetourt County, by G. W. Patteson and J. A. McCartney.

Michigan farm organization and practices: Type-of-farming area 9, L. H. BROWN (*Michigan Sta. Spec. Bul. 336 (1946), pp. 32, illus. 3*).—"This study was made to learn which enterprises and practices are becoming established and the relative profitability of the various types of farming." It is based chiefly on information from account records kept by farmers during the period 1936-43, and more

detailed information obtained in 1942 and 1943 by visits to 33 of the farmers. The history of the area (Arenac, Clare, Gladwin, Iosco, and Ogemaw Counties) and the lands are described briefly. The cropping program, the livestock program, the combination of enterprises, and organization on farms typical of the area are discussed. A chart shows the land utilization and land classes by counties. Tables show, among other things, the cropping pattern and crop yields on the farms studied; the livestock programs—numbers of animals, income, etc., from cattle, poultry, hogs, and sheep; the relation of dairy product sales and cattle income to farm earnings; and by counties, the utilization of land in 1940, and the proportion of land in various soil classes. Another table compares the size of business, crop programs, livestock programs, number of men, and other items on farms with typical organizations. The productive days' work per man per year and the labor income for these organizations were: Small dairy, 234 days and \$1,213; medium-size dairy, 341 and \$1,788; dual-purpose cattle and sheep, 242 and \$1,288; dairy, beef, and sheep, 331 and \$3,178; and beef breeding herd, 204 and \$309.

Facts about cotton and southern farming (*U. S. Dept. Agr., Misc. Pub. 594 (1946), pp. 64, numerous illus.*).—This publication, prepared in cooperation with the State Agricultural Extension Services, presents pictorially background information for farm leaders in the cotton section.

A farm management analysis of dairy farming in Putnam County, Georgia, 1944, J. C. ELROD and W. E. HENDRIX (*Georgia Sta. Bul. 244 (1945), pp. 55, illus. 24*).—"The primary objectives of the study have been: (1) To provide an analytical description of farms engaged in dairying, including their utilization of land, capital, and labor, their production rates, and their efficiency and success of operations; (2) to describe the dairy enterprise, including its use of land, buildings, and equipment, its labor requirements, production practices, and costs and returns; and (3) to ascertain factors generally associated with successful operations." It is based mainly on the 1944 operations of 54 farms from which milk was delivered to the Eatonton Cooperative Creamery. Data as to milk sales, feeds, supplies, etc., were obtained from the creamery. Data on 1944 operations were obtained in a field survey. Census reports, soil surveys, and other sources of data were also used. The county and the development of dairying in it are described. Analyses are made of the amount and distribution of capital, land use, crop acreages and yields, the livestock enterprise, labor organization, expenses, receipts, income, etc., for the farms studied, and also of the size of dairy herds, production rates, feeding practices, distribution of labor, buildings and equipment, costs, receipts, etc., for the dairy enterprise. More detailed analysis is made of the effects on returns of size of business, labor efficiency, production rates, cost of producing milk, milk prices, and balance of the farm business.

Some of the findings were: Milk sales accounted for 72.8 percent of the farm receipts, milk subsidy for 11.4, and crops for 7.2. Average milk production per cow on a 4 percent butterfat equivalent was 4,888 lb. Net cost of milk production averaged \$3.65 per 100 lb. Income to operator for labor and management averaged \$1,652 per farm. "As the number of factors in which the farm operator was average or above increased, the labor income increased. Farms that were below average in all of five factors (productive man-work units, production index, work units per man, proportion of man labor applied to cows, and number of cows) had an average labor income of only \$282. Farmers above average in only one factor had an average labor income of \$637, in two factors \$1,839, in three factors \$2,038, in four factors \$2,775, and in five factors \$4,571. A comparison of the 10 best farms with the 10 poorest farms indicates that the former were twice as large as measured by productive man-work units, had 26 percent higher production rates, made 28 percent more efficient use of labor, made 14 percent more efficient use of capital, had 149

percent more improved pasture per cow, purchased 28 percent less of the feed used, and had net cost per 100 lb. of milk produced 27 percent less than did the 10 poorest farms. Family-operated dairy farms in 1944 had a family labor income averaging \$1,904 compared with \$439 for family-operated cotton farms. Labor income on the two types of farms would have been about the same had milk sold for around \$2.45 per 100 lb. instead of for around \$4. Without the milk subsidy, income from the two types of farms would have been about equal had milk sold for around \$3.10 per 100 lb."

Economic studies of vegetable farming in New York.—III, Truck crop production and prices, E. G. MISNER ([*New York*] *Cornell Sta.*, A. E. 546 (1946), pp. 46+, illus. 5; A. E. 551, pp. 33+, illus. 5).—These are the second and third supplements to Bulletin 679 (E. S. R., 78, p. 711). No. 546 includes data on acreages, yields, production, prices, and farm values, 1936–45, and supplements A. E. 480 (E. S. R., 92, p. 718) by the addition of data for 1944 and 1945. No. 551 covers the years 1928–45, and is "based on revised estimates of acreage, yields, production, prices, and values by the Bureau of Agricultural Economics, U. S. Department of Agriculture."

Practices used in the production, canning, and marketing of northwestern Arkansas tomatoes in 1940–41, O. T. OSGOOD and T. R. HEDGES. (Coop. U. S. D. A.). (*Arkansas Sta. Bul.* 460 (1945), pp. 45, illus. 4).—"The purpose of this study has been to bring together a statement of the conditions, methods, and practices used in producing, canning, and marketing northwestern Arkansas tomatoes, to indicate the more efficient procedures being used, and to determine the quality and competitive position of tomatoes canned in the area." The operations of 77 tomato producers were surveyed during the fall and winter of 1940–41, and operators of 48 canneries were interviewed during the winter and spring of 1940–41. A total of 485 usable schedules were returned by buyers in 304 counties in 16 States. The farms on which tomatoes were produced and the tomato enterprise are described. The canneries and their operations are discussed and analysis made of the cost of canning tomatoes. The section on marketing discusses the Ozark pack, the marketing channels and practices, market area for Arkansas canned tomatoes, and the competitive position of Arkansas canned tomatoes. Some of the findings were:

The average production per farm in 1940 was 4 acres, yielding 3.3 tons per acre. An average of about 140 to 150 hr. of man labor per acre was required. About four-fifths of the growers contracted their tomatoes generally at \$10 to \$11 per ton. Seventy-five percent of the canners contracted for 90 percent or more of the tomatoes bought, and nearly one-third grew part of the tomatoes packed. The approximate average costs per No. 2 equivalent case of tomatoes for major items were: Cans 51 ct., tomatoes 26 ct., labor 10 ct. in addition to labor of operator or hired manager, other miscellaneous manufacturing costs 11 ct., selling costs 7 ct., and overhead plant costs 2.5 ct. Seventy-seven percent of the tomatoes packed by the canners studied were reported by the canners as standard grade. Practically all other grades reported were above standard. Of the buyers reporting the Ozark region as their usual source of purchases, 95 percent were located in the eight States in the first two tiers of States west of the Mississippi River and south of Minnesota. "In comparison with other competing areas, Arkansas has advantages in transportation costs in the western part of the market area, while in the northeastern part rates are favorable to Indiana. Along the Gulf Coast transportation costs favor the Maryland area. . . . Northwestern Arkansas is a production area of standard grade canned tomatoes. Color, and other factors associated with it, limits most of the tomatoes to standard grade. A good standard pack may well be the basis for any program for the area, until varieties and cultural practices have overcome present handicaps to production of highest quality tomatoes."

Agricultural geography of the Philippine Islands: A graphic summary, R. G. HAINSWORTH and R. T. MOYER (*U. S. Dept. Agr., Off. Foreign Agr. Relat.*, 1945,

pp. 72+, illus. 45).—The 45 maps and charts, with the accompanying 23 tables and text, cover among other things the size and location of the Islands, the population, the relief, climate, vegetation, soils, land resources and utilization, land tenure, total and cultivated acreages per farm, the various food crops for domestic consumption, the different export crops, the food supply, the distribution of livestock and poultry, and exports to and imports from the United States and other countries.

Foreign Agriculture [February-March 1946] (*U. S. Dept. Agr., Foreign Agr.*, 10 (1946), Nos. 2, pp. 17-32, illus. 6; 3, pp. 33-48).—No. 2 consists of an article, Ecuador's Agriculture and the War, by K. H. Wylie (pp. 18-32), discussing, among other topics, the development of the agriculture of the country; its crop pattern; the export, domestic food, and raw material crops; the government policies affecting agriculture; the livestock; the effects of World War II; and the postwar problems.

No. 3 includes an article, Chilean Agricultural Policy, by O. Moore (pp. 34-45), dealing with the trade in agricultural products, the status of agriculture, land tenure, prewar and wartime measures affecting agriculture, and the transitional and postwar prospects for Chile. A second article, United Kingdom Production and Marketing Policy for Sheep, by D. D. Jones (pp. 45-48), discusses the prewar and wartime controls, the trends in number of sheep, and the official postwar plans.

Improving farm labor efficiency, E. F. REBMAN (*Michigan Sta. Spec. Bul.* 334 (1945), pp. 18, illus. 2).—The amount of work accomplished per man during 1943 on individual farms in the farm-accounting project in central Michigan ranged from 40 to 165 percent of the average of 289 productive man-work units. With a view to ascertaining the causes of the differences, this analysis was made of 32 farms in south-central Michigan that had an average labor efficiency of 370 productive man-work units per man during 1943 as compared with 14 farms with an average of 185 units.

"In general, the farmers who had high labor efficiency had larger businesses, had more livestock, had more crops, had more and larger machinery, had a better farm layout, were younger men, and had more incentives to accomplish more work."

Egg and poultry marketing practices in West Virginia, M. A. ABRAHAMSEN (*West Virginia Sta. Bul.* 323 (1945), pp. 39, illus. 2).—"The purpose of this study was to obtain first-hand information with respect to the marketing methods followed by West Virginia farmers in disposing of their eggs and poultry. Attention also was given to the buying and selling methods followed by the various kinds of agencies handling eggs and poultry." Records relating to egg and poultry marketing were furnished by 203 farmers in four counties (Berkeley, Monongalia, Upshur, and Wood) that had 25 or more laying hens on January 1, 1944. The importance and characteristics of the egg and poultry enterprise in the State, the seasonal distribution of sales, egg prices, etc., are described. The marketing agencies, the distribution of sales among them, producers' opinions regarding the prevailing markets, the buying and selling practices of purchasing agencies, etc., are discussed, and some suggestions made for improving production methods and marketing practices and for increasing the operating efficiency of receiving agencies.

Air transport of agricultural perishables, R. W. HOECKER ET AL (*U. S. Dept. Agr., Misc. Pub.* 585 (1946), pp. 44, illus. 4).—This publication, dealing with postwar adjustments in the marketing of agricultural products, was prepared by the Working Group on Conversion of Marketing Facilities and Methods of the Interbureau Committee on Postwar Programs. It discusses the present development of air cargo, the present and estimates of future air cargo rates, new developments in air transportation, facilities for handling air cargo, and the economies of air transportation. Some savings in refrigeration costs and case studies of possible economies in air transportation of strawberries, tomatoes, and lettuce are shown. The retention of food value by air shipment, use of the airplane for quick-freezing foods, and potential domestic cargoes of fruits, vegetables, flowers, and livestock and poultry products are discussed. Other sections deal with seasonal factors in air transportation,

potential domestic cargo of industrial products, air transportation in foreign trade, and the competitive position of the air-freight carrier.

Membership relations in farmers' cooperatives, A. L. LARSON (*Oklahoma Sta. Cir. 122 (1946), pp. 8, illus. 4*).—The kinds of information on operation of the organization desired by the members and the information which the organization needs about its members are discussed, as are also methods for presenting information to members and for obtaining data on their attitudes.

Crops and Markets [January 1946] (*U. S. Dept. Agr., Crops and Markets, 23 (1946), No. 1, pp. 72, illus. 1*).—Among the numerous tables included are ones showing the acreages, yields, and production, by States, and for the United States, of different crops in 1945, with comparisons with other periods; summary tables showing estimated acreages planted and not harvested by years 1929–45, acreage of fruits 1929–45, utilization of corn 1944 and 1945, total harvested acreage of principal crops, etc.; the employment of farm labor by geographic divisions, January 1, 1945, with comparisons; farm wage rates by States, January 1, 1945, and 1946; prices received and paid by farmers; and average monthly prices received by farmers for important crops 1908–45. Livestock reports include tables on egg production, hog-corn ratios, milk production, etc. Market reports of the usual types are included for cotton, dairy and poultry products, feed, grain, livestock, meats, etc. A short article (pp. 44–45) discusses the cost of producing field crops in 1944, with tables showing by States or regions the estimated gross and net costs per acre for corn, wheat, oats, and cotton; and the net cost per bushel for the grains and per pound for cotton.

Farm production, farm disposition, and value of cotton and cottonseed, and related data, 1928–44, by States, H. L. RASOR and E. S. MINOR (*U. S. Dept. Agr., Bur. Agr. Econ., 1945, pp. 41+*).—Data for the years 1943 and 1944 are added to the tables in a publication of the same title covering the years 1928–42 (*E. S. R., 91, p. 759*).

Current Farm Economics [February 1946] (*Cur. Farm Econ. [Oklahoma Sta.], 19 (1946), No. 1, pp. 23, illus. 4*).—Included are the monthly review of the agricultural situation, the usual tables of prices and price indexes, and the article, *Membership Relations in Farmers' Cooperatives*, noted above.

RURAL SOCIOLOGY

Planing programs for veterans in rural areas, E. R. HOSKINS (*[New York] Cornell Sta. Bul. 825 (1945), pp. 57+, illus. 1*).—This study, based on the educational records and work experiences of 800 young men in service, selected from the honor rolls of 3 rural areas in central New York, "represents a large group of servicemen from a particular geographical area. It provides not only a basis and a program for the postwar adjustments of an appreciable group of men and for a relatively large area, but also a pattern by which other communities may approach similar postwar problems of adjustment. It designates a definite group of men with certain qualifications, and includes the total resources of the area. It appraises the educational facilities and other resources within these communities and opportunities for nearby employment. It emphasizes the need for refresher courses and the new opportunities of education and employment within the area and in nearby cities. It suggests the policies of reemployment for the area. In brief, this study provides a basis for local and larger-area planning whereby agencies of education and employment services may be made available effectively for returning veterans."

A demographic study of the American Negro, T. L. SMITH. (*La. State Univ. (Social Forces, 23 (1945), No. 3, pp. 379–387*).—"This paper is a summary of the data concerning the demographic situation and trends among the American Negro population."

AGRICULTURAL AND HOME ECONOMICS EDUCATION

Conference report on the contribution of extension methods and techniques toward the rehabilitation of war-torn countries, Washington, D. C., September 19-22, 1944 (*U. S. Dept. Agr., Ext. Serv. and Off. Foreign Agr. Relat., 1945, pp. 239+*).—This is the report on a conference called by the Extension Service and the Office of Foreign Agricultural Relations, jointly, to bring together available information on extension methods and to analyze past experiences in extending scientific information to farm people, so that this fund of knowledge might be made applicable to people in war-torn areas. The conference was organized around 9 areas with a committee reporting for each, and a tenth committee which concerned itself with the experience and contributions of private agencies in the field of extension.

OES eleventh annual survey, G. ADAMS. (*U. S. D. A.*). (*Jour. Home Econ., 38 (1946), No. 3, pp. 159-161*).—Research findings published by the State agricultural experiment stations in 1944-45 are listed here under these classifications: Food selection and preparation; food preservation; nutritive value of foods; family economics; and home management, housing, and household equipment.

FOODS—HUMAN NUTRITION

Food values under the cream layer of a quart of milk, L. M. DORSEY. (*Univ. Maine*). (*Milk Dealer, 34 (1945), No. 6, pp. 49-50*).—Based on the nutritive value of whole milk (*E. S. R., 83, p. 270*), this study gives calculations and comparisons concerning skim milk. The energy value is estimated at 505 calories per quart; mineral matter content is slightly higher than that of whole milk on this basis; and trace elements such as manganese, cobalt, copper, molybdenum, fluorine, and possibly others are recognized. Although the fat-soluble vitamins are lessened in amounts when the cream is removed, appreciable quantities still are found present because ordinary skimming processes do not produce a true skimmed milk. Protein contents of a quart of under milk are slightly higher than in whole milk.

Human milk studies, XIX-XXVII (*Amer. Jour. Diseases Children, 70 (1945), No. 3, pp. 135-199, illus. 20*).—Studies in continuation of this series (*E. S. R., 73, p. 887*), bearing on the nutritive value of human milk, include the following: XIX—Implications of Breast Feeding and Their Investigation, by I. G. Macy, H. H. Williams, J. P. Pratt, and B. M. Hamil (pp. 135-141); XX—The Diet of Lactating Women and the Collection and Preparation of Food and Human Milk for Analysis, by M. Kaucher, E. Z. Moyer, A. J. Richards, H. H. Williams, A. L. Wertz, and I. G. Macy (pp. 142-147); XXI—A Simple Technic for the Manual Expression of Mother's Milk, by V. Davies (pp. 148-149); XXII—Nicotinic Acid, Pantothenic Acid, and Biotin Contents of Colostrum and Mature Human Milk, by M. N. Coryell, M. E. Harris, S. Miller, H. H. Williams, and I. G. Macy (pp. 150-161); XXIII—Free and Total Thiamine Contents of Colostrum and Mature Human Milk, by C. E. Roderuck, H. H. Williams, and I. G. Macy (pp. 162-170); XXIV—Free and Total Riboflavin Contents of Colostrum and Mature Human Milk, by C. E. Roderuck, M. N. Coryell, H. H. Williams, and I. G. Macy (pp. 171-175); XXV—Ascorbic Acid and Dehydroascorbic Acid in Colostrum and Mature Human Milk, by B. Munks, A. Robinson, H. H. Williams, and I. G. Macy, with the assistance of M. Leshner, M. E. Harmon, J. K. Brody, J. Anderson, and R. Rust (pp. 176-181); XXVI—Vitamin A and Carotenoid Contents of Colostrum and Mature Human Milk, by M. Leshner, J. K. Brody, H. H. Williams, and I. G. Macy (pp. 182-192); and XXVII—Comparative Values of Bovine and Human Milks in Infant Feeding, by J. M. Lawrence, B. L. Herrington, and L. A. Maynard (pp. 193-199) (*Cornell Univ.*).

Fruit and vegetable products and by-products, W. V. CRUESS. (*Univ. Calif.*). (*Fruit Prod. Jour. and Amer. Food Mfr., 25 (1946), No. 7, pp. 203-206*).—The author

gives an outlook into California's horticultural industries in regard to the threat of future overproduction of fruits, vegetables, and other products. Attention is called to some of the more important fruit and vegetable products that appear to offer promise of new usages. These products include those which can be frozen satisfactorily, made into fruit candies, bakery products, fruit beverages, ice creams and ices, children's sieved foods, and dehydrated products and those which can be utilized for such byproducts as citric acid, pectin, concentrates, stock feeds, and oils from citrus fruits.

The preservation of freshness in vegetables and fruits from harvest to consumption. E. P. BRASHER, G. M. GILLIGAN, C. W. WOODMANSEE, and E. M. RAHN. (Del. Expt. Sta.). (*Fruit Prod. Jour. and Amer. Food Mfr.*, 25 (1945), No. 6, pp. 168-170).—The results of this study indicate that the use of cracked ice or ice refrigeration in marketing the fruits and vegetables considered offers a means of reducing losses due to weight-shrinkage and spoilage, and enhances the retention of ascorbic acid, freshness, and palatability. "Only in the case of tomatoes and peaches did refrigeration seem slightly superior to that of snow ice for retaining appearance. When stored at room temperature, lima beans were unfit for human consumption after 1 day; sweet corn, kale, and cantaloups, 2 days; and tomatoes, 4 days."

Legume and cereal sprouts as a dietary substitute for fresh vegetables. W. A. ANDREAE, E. A. CHALMERS, and W. D. MCFARLANE (*Sci. Agr.*, 25 (1945), No. 8, pp. 504-523, illus. 6).—A detailed description is given of several methods developed for sprouting cereal and legume seeds in bulk. Wooden tubs were best for sprouting Windsor broad beans, vetch, soybeans, and cereals; shallow screen bottom trays were best for peas. An open bag, for use in mobile camps, was acceptable for all types of seeds. Recipes for the use of the sprouts are presented. "The beans were best served as a vegetable, thick soup, or in stew; the peas in salad; the vetch in meat or tomato mixtures; soybeans in vegetable dishes or in salads; and cereals in porridge or with rice.

"It was estimated that one serving (approximately 6 oz. as vegetable, 2 oz. as salad) of Windsor broad beans, vetch, and pea sprouts would supply half the daily requirement of vitamin C. The amount of riboflavin is considered to be insignificant."

Improving peanut butter quality. J. G. WOODROOF and H. H. THOMPSON. (Ga. Expt. Sta.). (*Food Packer*, 26 (1945), No. 12, pp. 35-37, 56-57, 60, illus. 3).—Essentially noted elsewhere (E. S. R., 94, p. 828).

Jellied fruit candies. W. V. CRUESS. (Univ. Calif.). (*Fruit Prod. Jour. and Amer. Food Mfr.*, 25 (1946), No. 6, pp. 166-167).—Candies made with pectin, sugar, and either fruit puree or juice may be as adaptable for cutting and wrapping as ordinary candy bars. A typical formula that has been used experimentally in two commercial candy factories is 40 lb. fruit puree, 30 lb. glucose sirup (or invert), 30 lb. cane sugar, 20 oz. powdered pectin, and 8 oz. citric acid, dissolved in 2 pt. of water. Directions for mixing are given, and suggestions for substitutions include replacing the 8 oz. of citric acid with 1 gal. of fresh lemon juice or, if fruit juice is used, replacing the 40 lb. of fruit puree with approximately 5 gal. of the juice. The usual coating for these candies is confectioners' coarse sugar.

Oxidative deterioration of fats in cereal products. H. O. TRIEBOLD. (Pa. State Col.). (*Oil and Soap*, 22 (1945), No. 12, pp. 334-336).—An address.

Toxicity of rancid fats. F. W. QUACKENBUSH. (Purdue Univ.). (*Oil and Soap*, 22 (1945), No. 12, pp. 336-338).—An address.

Determination of shelf life of packaged cereals. C. E. FELT, A. C. BUECHELE, L. F. BORCHARDT, R. C. KOEHN, F. A. COLLATZ, and F. C. HILDEBRAND (*Cereal*

Chem., 22 (1945), No. 3, pp. 261-271, illus. 3).—A puffed corn cereal and a puffed oat cereal were packaged under commercial conditions in cartons containing standard single-waxed cereal glassine liners. They were distributed to 12 cities and stored beginning in April. Examinations were made at biweekly intervals for eating quality and moisture content.

The shelf life of the products was determined by this field study and by theoretical mathematical calculation based on moisture content, vapor pressure, temperature, and weather conditions in the areas under consideration. With one exception, good agreement was obtained between the calculated and actual results.

The authors conclude that "the shelf life of a packaged cereal varies widely, depending upon the season, upon the section of the country in which the package is placed, and, to a lesser extent, upon the hygroscopic properties of the product itself."

Cakes and cookies—recipes for different altitudes, W. E. PYKE and M. BROWN (*Colorado Sta. Bul.* 489 (1946), pp. 36, illus. 11).—Tested recipes and corrections for their application at certain altitudes are presented. The important features of altitude cookery are given in technical terms, and less technical information is also noted for home usage. The leavening correction, applying usually to baking powder or soda, is accomplished by decreasing its content when the sugar-flour ratio in the recipe remains unchanged. As the altitude at which the cake is to be baked increases, the water content should be increased, generally accomplished by providing an increase in the milk or egg content. The sugar-water ratio is related to the kind of shortening used—hydrogenated shortening, lard, or butter. Hydrogenated shortenings are divided into two types—the ordinary and the high-water-tolerant; the latter gives a more effective distribution of water and a smaller amount is required. When natural shortenings are used, most of the water-furnishing ingredients should be mixed into the batter a little at a time to prevent severe curdling. At a 10,000-ft. elevation, the internal temperature attained within a baking cake will be at least 18° F. lower than at sea level due to lowered boiling points, making the structural strength of the flour and eggs much less. Egg added as a form of liquid would provide additional strength to counteract the tenderizing effect of altitude. Suggestions for measurements, equipment, and general baking and mixing methods are discussed.

Practical cookery and the etiquette and service of the table (*Manhattan: Kans. State Col.*, 1945, 21. ed., rev., pp. 506, illus. 19).—This book, a revision of an earlier edition, is a compilation of principles of cookery and recipes with suggestions for etiquette for various occasions.

Imitation clove oil effective in spicing pickles, F. W. FABIAN and V. HARRIS. (Mich. State Col.). (*Food Indus.*, 17 (1945), No. 6, pp. 88-90, illus. 2).—Solutions of natural clove oil, imitation clove oil, and three clove oil constituents were used to spice sweet pickles (1 : 1,000 dilution and a duplicate set with 1 : 2,000 dilutions) and allowed to stand for a 30-day period. At the end of this period, the liquor was drained off the pickles and total liquor and pickle washings were assayed as such by distilling in the Clevenger apparatus.

Results showed that imitation clove oil is absorbed by the pickles equally as well as the natural clove oil in both high and low dilutions, and apparently there was no great difference in the absorption between the three components of the imitation clove oil. Work on the solubility of the essential oils of whole cloves showed that of the pickling materials used in manufacture, acetic acid was the best solvent—2 percent extracted about 25 percent of the oil, while 2 percent salt extracted only about 10 percent and a 35-percent-by-weight sugar solution only about 3.5 percent. Since the ether-soluble portion of the pickles has a greater affinity for the clove oil than the liquor in which it is suspended, the greater amount of the oil would be taken up by

the pickles; about 25 percent of the oil was found in the liquor and about 75 percent in the pickles for both the natural and imitation clove oils.

New germicides for food processors, G. J. HUCKER. (N. Y. State Expt. Sta.). (*Canning Trade*, 68 (1946), No. 29, p. 7).—Quite recently there has been made available a series of compounds which show considerable promise in checking slime-producing organisms which collect on dairy and food plant equipment. The quaternary ammonium compounds, appearing under a number of trade names, are odorless in the small concentrations which are used in routine sterilizing procedures; are noncorrosive; readily soluble in water; nontoxic; and unaffected by light, excess heat, or long storage. Their sterilizing properties are lost, however, when mixed with soaps, with many cleaning powders, and synthetic detergents. It has been found that a number of the spore-forming bacteria (particularly those associated with flat sour spoilage) are completely killed in concentrations varying from 1 : 5,000 to 1 : 15,000 upon a 10-min. exposure; concentrations as high as 1 : 25,000 will kill over 95 percent of the organisms in pure culture of common non-spore-forming types,

Bacteriological studies relating to thermal processing of canned meats, [I]—III, C. R. STUMBO, C. E. GROSS, and C. VINTON (*Food Res.*, 10 (1945), Nos. 3, pp. 260–272, illus. 5; 4, pp. 283–302).—A series of studies has been made on the influence of various factors, such as curing agents and concentration of spores, upon the heat processing necessary to prevent spoilage of canned meat.

[I]. *Laboratory methods employed for studying factors which influence the thermal processes required to prevent bacterial spoilage of canned meats*.—In this preliminary paper, a detailed illustrated description is presented of a method devised to study the thermal resistance and growth of bacteria in canned meat.

Heat-resistant spores of a putrefactive anaerobe were isolated from spoiled, cured, and canned meat and served as the test material. Small tubes containing various samples of mixed ground pork and spore suspensions were heated at 220°, 230°, 240°, and 250° F. to determine the thermal death time of the spores.

The advantages of the method are considered to be: Its use with a wide variety of meats which have been treated or processed under different conditions; the compactness of the method, as small tubes were used and a large number of them could be conveniently incubated; the meat could be mechanically introduced, and the spores readily cultured with little danger of contamination; and progressive spoilage of the processed meat could be observed through the glass walls of the tubes during incubation.

II. *Influence of meat-curing agents upon thermal resistance of spores of a putrefactive anaerobic bacterium in meat* (pp. 283–292).—The curing agents commonly employed for curing meat (sugar, salt, sodium nitrate, and sodium nitrite) were studied separately or together. They exerted no influence on the heat processes necessary to sterilize meat inoculated with known concentrations of spores of a putrefactive anaerobe similar to *Clostridium sporogenes* and *C. botulinum* (see above). "The higher the concentration of spores in the meat, the more severe were the heat processes necessary to sterilize it."

III. *Influence of meat-curing agents upon growth of a putrefactive anaerobic bacterium in heat-processed meat* (pp. 293–302).—The various inoculated and processed tubes of meat were stored at 28° C. and examined periodically over a 1-yr. period. The authors conclude that "the data would seem to support the following statements: (1) Sugar (1 lb./100 lb. of meat) alone was ineffective in preventing spoilage of the meat; (2) sodium nitrate (2¾ oz./100 lb. of meat) alone was ineffective in preventing spoilage; (3) sodium nitrite (¼ oz./100 lb. of meat) alone was ineffective in preventing spoilage but did appreciably delay germination; (4) salt in a concentration of 3½ lb./100 lb. of meat seemed to inhibit spoilage of all but a

few tubes of meat for at least 1 yr., while in a concentration of 1½ lb./100 lb. of meat it has not inhibited spoilage to the same degree; (5) salt and sodium nitrite together; salt and sodium nitrate together, or salt, sodium nitrite, and sodium nitrate together have thus far proved very little if any more effective in preventing spoilage than salt alone; and (6) the data show that over a period of 1 yr. sodium nitrate, either alone or in combination with other curing ingredients, has not appreciably influenced spoilage and, therefore, growth of putrefactive anaerobe *S.* in the meat."

Canning beef, J. G. WOODROOF and I. S. ATKINSON (*Georgia Sta. Cir.* 150 (1946), pp. 8, illus. 4).—The results reported here are from two series of experiments run in 1944 and 1945. Using a single animal divided into halves, one side was cut into steaks, roasts, and stew meat and canned while fresh; the other half was aged at 36° to 38° F. for 8 days before cutting and processing. One year later, the cans opened for examination (previously heated in boiling water) showed that aging improved the texture and flavor of the steaks, searing improved the flavor, and precooking by boiling destroyed aroma and flavor. Processing at 10-lb. pressure developed the highest flavor and best texture; best processing time was found to be 60–70 min. for steaks and 80–90 min. for roasts and stew meat.

Examination of canned apple juices, J. FORGACS, W. A. RUTH, and F. W. TANNER. (Univ. Ill.). (*Food Res.* 10 (1945), No. 3, pp. 227–237).—The analyses of several varieties of apple juice at canning and after storing for 2 yr. at room temperatures revealed that many different types of bacteria and other microorganisms were present—rod-shaped bacteria being the most prevalent. Changes in the total acidity and pH were evident at the time the experiment was discontinued; although no close correlation existed between them, hydrogen-ion concentration decreased while acidity (calculated as malic acid) increased; refractometer readings decreased during storage. The problem of clouding was studied, although it was not directly accounted for. Regarding the examination of cans, results showed that some cans were normal in appearance, while others were springers or flippers. Pitting was observed in most swelled and normal cans, but varied considerably and was confined to the seams and bottom.

Home canning, I–II. (Mass. State Col.). (*Food Res.*, 10 (1945), No. 3, pp. 197–226, illus. 2.)

I. Survey of bacteriological and other factors responsible for spoilage of home-canned foods, R. G. Tischer and W. B. E. Esselen, Jr. (pp. 197–214).—A detailed description is given of the methods and technics used in determining spoilage in home-canned foods, and the results are tabulated. In all, 293 samples of sound and spoiled home-canned foods were examined to determine: (1) Appearance of container, (2) appearance of food, (3) vacuum or pressure, (4) odor, (5) pH value, (6) bacteria observed with the microscope, and (7) presence of viable microorganisms.

Bacteriological culture tests appeared to be the most reliable criterion of spoilage. More than half of the 146 samples submitted as sound contained viable microorganisms, indicating faulty canning technic and the possibility of spoilage, while 97 percent of the samples submitted as spoiled gave some evidence of spoilage. The spores of four putrefactive anaerobes isolated from spoiled jars of asparagus, lima beans, and snap beans survived heating for 30 min. at 110° C. (230° F.) and 320 to 820 min. at 100° C.

The authors conclude from these results that about three-fourths of home-canning spoilage is due to understerilization and one-fourth to improper sealing. The boiling-water-bath method of processing was not adequate to destroy certain types of bacteria present in many low-acid vegetables. While a pressure canner correctly used was satisfactory for processing, understerilization could result if it is misused.

A survey of the spoilage actually encountered by home canners who submitted samples showed that approximately 2 percent spoilage was observed by 90 families who canned 22,544 jars of food in 1942.

II. *Determination of process times for home-canned foods*, W. B. Esselen, Jr. and R. G. Tischer (pp. 215-226).—A method is described in which the theoretical process times were determined for home-canned asparagus, beets, carrots, corn, green beans, peas, spinach, and squash in pint jars. The processing temperatures used were 100° and 115.6° C.

Results showed that in a pressure canner at 115.6° C. the theoretical process times might be somewhat shorter than the present recommended process times. In a boiling-water bath (100°), the process times ranged from 5½ to 12 hr.—considerably longer than the times recommended at present for home canning.

In the pressure-cooker type of canning, the relatively long come-up time and slow air-cooling period are responsible for much of the sterilizing value of the process (18 to 35 percent occurring during cooling alone). In the boiling-water-bath method, 90 to 98 percent of the lethal value occurs during the actual processing—the effect of come-up and cooling periods being relatively small.

The authors indicate that particular stress should be placed on correct operation and maintenance of pressure canners to obtain the maximum sterilizing value from a given process.

New methods produce superior dehydrated cut fruits, I-III. (Univ. Calif. et al.). (*Food Indus.*, 17 (1945), Nos. 2, pp. 94-97, 178-184, illus. 3; 5, pp. 96-98, 180-188, illus. 2; 6, pp. 84-87, illus. 3).—This article, part 1 by H. J. Phaff, R. L. Perry, and E. M. Mrak; part 2 by H. J. Phaff, G. L. Marsh, E. M. Mrak, and C. D. Fisher; and part 3 by H. J. Phaff, E. M. Mrak, R. L. Perry, and C. D. Fisher, presents the principles of sulfuring fruits under large-scale commercial experimentation. Three varieties of apricots were prepared for dehydration by blanching 1½ to 4 min. in a continuous blancher, predrying, and sulfuring 3 to 3½ hr. (9 lb. of sulfur burned per ton of cut fruit). Freestone peaches were dehydrated in a manner similar to apricots, although the blanching time varied from 4 to 7 min. and predrying and sulfuring required a longer time (amount of sulfur reduced to 5 lb./ton). In contrast to the dehydration of apricots and freestone peaches, the clingstone peaches were sulfured after blanching without being subjected to a preliminary drying period. Due to the firmness of the flesh, the peaches did not have a tendency to bleed in the sulfuring house, although, it was necessary to allow the fruit to cool to about 120° F. before sulfuring. The sulfuring period required 3 hr., and 7 lb. of sulfur were used per double car of fruit. Whole clingstone peaches may be successfully dehydrated when adjustments of the sulfuring procedure are made. Dehydration of pears required about 26 to 30 hr. at a finishing temperature of 140°, after 12 to 16 min. of blanching, and sulfuring for 8 hr. (12 to 15 lb. of sulfur for each pair of single cars of fruit). "Because of the high sulfur dioxide retention during dehydration as compared with sun drying, the bulk storage of unprocessed dehydrated fruit is superior as far as darkening is concerned. However, when compared under identical storage conditions the keeping qualities are equal."

The dehydration of kale, J. S. CALDWELL, C. W. CULPEPPER, B. D. EZELL, M. C. HUTCHINS, and M. S. WILCOX. (U. S. D. A.). (*Commer.*, 101 (1945), No. 25, pp. 13-14, 16, 28, 30, 32).—Lots of three varieties of kale were blanched by different treatments and for varying lengths of time. Drying was begun at 175° and completed at 150° F., reducing the moisture content to 4.5 percent. After dividing into two portions, one lot was packed in hermetically sealed containers in carbon dioxide and stored at 32°, and the other was placed in nonairtight containers and stored at 70°-75°. "When examined after 2 months' storage, all samples of Blue Curled

Scotch and Dwarf Green Scotch, except those that had been sulphured or dried raw, were very good to excellent in quality; Dwarf Siberian was slightly less good in both color and flavor. . . The material stored in carbon dioxide at 32° was slightly superior in flavor after 2 mo. to that stored in air at 75°. . . . Approximately half of the original content of each vitamin was retained after dehydration and storage for 5½ mo. in air at 75°, slightly more in carbon dioxide at 32°."

The plant leaves were divided into groups on the basis of stage of development, and determinations made upon the vitamin content showed that ascorbic acid was maximum in amount in the youngest leaves which had not yet unfolded and decreased progressively with maturity. The carotene content of these young blades was relatively low, but their petioles showed high carotene before elongation began.

Quick test for peroxidase aids in dehydration control, E. H. LUCAS and D. L. BAILEY. (Mich. Expt. Sta.). (*Food Indus.*, 17 (1945), No. 2, pp. 82-83, illus. 1).—Essentially noted elsewhere (E. S. R., 91, p. 503).

Instructions on processing for community frozen-food locker plants, M. B. MATLACK (U. S. Dept. Agr., Misc. Pub. 588 (1946), pp. 52, illus. 4).—Processing methods are given for the preservation of foods by freezing and include their preparation, packaging, freezing, thawing, and cooking. Suggestions for the care of frozen foods after removal from the frozen-food locker, sanitation problems, and packaging materials (including a list of manufacturers) are also noted.

Histological characteristics, tenderness, and drip losses of beef in relation to temperature of freezing, R. L. HINER, L. L. MADSEN, and O. G. HANKINS. (U. S. D. A.). (*Food Res.*, 10 (1945), No. 4, pp. 312-324, illus. 4).—Longissimus dorsi muscle of beef was frozen at 18°, 0°, -10°, -40°, and -114° F. in air without forced circulation. The histological changes occurring with different rates of freezing were investigated. This study included only meat frozen and examined within 24 to 36 hr.

Freezing at 18° produced large interfibrillar ice areas which caused the fibers to bunch together. No intrafibrillar ice crystals or areas were noted. As the freezing temperature was lowered, the size of ice crystals and ice areas became smaller. Intrafibrillar freezing and fiber-wall damage was visible at 0°, and both became more extensive as the freezing temperature decreased. At -114°, the fibers split longitudinally into several sections and intrafibrillar ice crystals were very extensive and small.

Various methods for preparing the tissue for fixing and staining are described.

Tenderness tests were made on beef samples aged 5 days, cut 1½ in. thick, and frozen at the above temperatures. Tenderness was found to increase as freezing temperature was lowered and the time shortened. This was believed to be due to increased fiber rupture caused by intrafibrillar ice as well as to stretching and rupturing of the interstitial connective tissue.

Drip during subsequent thawing decreased as freezing temperatures were lowered. The authors assume that increased intrafibrillar freezing and rupturing of fibers permits the proteins to reabsorb a large proportion of the water originally frozen in the meat.

Freezing muscadine grapes, J. G. WOODROOF and I. S. ATKINSON (*Food Packer*, 26 (1945), No. 12, p. 48).—Essentially noted elsewhere (E. S. R., 94, p. 538).

The use of calcium salts in freezing McIntosh apples, J. J. POWERS and W. B. ESSELEN, JR. (Mass. Expt. Sta.). (*Fruit Prod. Jour. and Amer. Food Mfr.*, 25 (1946), No. 7, pp. 200-202, 217, illus. 3).—Normal colored and green McIntosh apples were washed, peeled, cored, and cut into ½ in. slices and held in 0.1 percent sodium chloride brine until treated with varying solutions of calcium chloride. Concentrations from 0.03 to 1.5 percent of calcium chloride were desirable—the

amount of calcium used and the length of treatment depending upon such factors as the original firmness of the apples, the length of time they had been in storage (fresh and cold storage apples were tested), and the degree of firmness desired. These calcium treatments were found to be successful in preventing excessive softness or mushiness in the green or ordinary McIntosh apples. Evaluations of the effectiveness of calcium chloride as a firming agent upon frozen, canned, and fresh sliced apples were made after readings on the penetrometer jelly-strength tester were taken on each of the three groups.

Electronics in food processing—blanching by electronics involves new principles, J. C. MOYER. (N. Y. Stat Expt. Sta.). (*Food Packer*, 27 (1946), No. 2, pp. 35-36, illus. 2).—Preliminary experiments (E. S. R., 94, p. 533) with electronically blanched vegetables presents a basis for this study, which points out that dielectric heating would be superior as a blanching agency.

Incidence and distribution of *Clostridium botulinum* in soils of Illinois, M. T. JONES and F. W. TANNER. (Univ. Ill.). (*Food Res.*, 10 (1945), No. 3, pp. 238-245).—Results indicated that 7.2 percent of 604 soil samples from 88 counties produced positive toxic cultures. About 25 percent of the counties in Illinois had toxin-producing soil samples, with the southern counties showing over 2½ times as many positive tests as the northern counties (36.5 v. 14). The toxin was identified as type B. The danger of *Clostridium botulinum* producing toxin in home-canned foods unless proper precautions are observed is emphasized.

A symposium on the effects of soil elements on food, T. J. BROOKS (*Tallahassee: Fla. State Dept. Agr.*, [1946], pp. 175).—This volume brings together for convenient reference many studies that bear on the problem of food values in relation to the soil elements. These studies, credited to the original source, cover the following topics: Soils (pp. 11-12); Physical Requirements (pp. 13-14); Soil and Health (pp. 15-16); Soil Fertility and Human Nutrition (pp. 17-19); Health from the Ground Up, by R. Beach (pp. 20-23); Experiment Station Research on the Vitamin Content and the Preservation of Foods, by G. Adams and S. L. Smith (pp. 24-40) (U. S. D. A.) (E. S. R., 91, p. 218); Soils and Food, by C. G. Henry (pp. 41-57); Soil Mineralization (pp. 58-61); The Minor Elements Play No Minor Role in Florida, by H. Mowry (pp. 62-64); Pasture Grass Improved by Adding Minor Minerals, by J. C. Brossier (pp. 65-68); Notes on Animal Nutrition (pp. 69-74); Soil-Builders, by V. Schoffelmayer (pp. 75-79); Some Symptoms of Citrus Malnutrition in Florida, by A. F. Camp and B. R. Fudge (pp. 80-82); The Effect of Agricultural Practices on Health and Disease, by J. A. Shield (pp. 83-90); Soil Fertility and Its Health Implications, by W. A. Albrecht (pp. 91-102); Producing More Beef From Phosphorus-Deficient Ranges (pp. 103-104); Biological Assays of Soil Fertility, by W. A. Albrecht and G. E. Smith (pp. 105-120) (Mo. Expt. Sta.) (E. S. R., 89, p. 175); Studies on the Interrelation of Fats, Carbohydrates, and B-Vitamins in Rat Nutrition, by R. K. Boutwell, R. P. Geyer, C. A. Elvehjem, and E. B. Hart (pp. 121-137) (Wis. Sta.) (E. S. R., 94, p. 542); Corn and Wheat Embryo, by E. Levin (pp. 138-153); Vitamins from Grass and Alfalfa, by W. A. Harding (pp. 154-165); Are We Starving to Death? by N. M. Clark (pp. 166-170); As the Soil, So the Man (pp. 171-173); and Research Project Started by Dr. Ouida A. Abbott Grows (pp. 174-175).

Magnesium content of meats, V. TOSCANI (*Food Res.*, 10 (1945), No. 6, pp. 461-464).—The meats previously studied for proximate and some mineral values by Toscani et al. (E. S. R., 73, p. 268) have been assayed for magnesium. The 71 samples included beef, lamb, and veal muscle meat, and beef tongue, liver, kidney, and brain. The magnesium values, in terms of milligrams per 100 gm., moist weight, averaged from 19.3 to 25.5 mg. for the various muscle tissues, tongue, and liver. The

lowest value was found in lamb, and the highest in veal. Beef brain and kidney averaged 13.0 and 14.0 mg., respectively. These values are considered to be in good agreement with previously published data.

Response of rats to boron supplements when fed rations low in potassium, J. T. SKINNER and J. S. MCHARGUE. (Ky. Expt. Sta.). (*Amer. Jour. Physiol.*, 143 (1945), No. 3, pp. 385-390, *illus. 1*).—Rats were fed a basal diet low in potassium (51 p. p. m.) and containing negligible amounts of boron (0.45 p. p. m.), plus boron supplements of 100, 250, 500, and 1,000 p. p. m. as boric acid or 1,000 p. p. m. as borax. Some of the animals receiving borax were also fed 100 or 250 p. p. m. supplements of K. The survival time of 54 pairs of rats under 7 sets of conditions are tabulated.

Results showed that rats receiving either boric acid or borax survived longer than pair mates receiving no boron when a low-potassium diet was fed. After 21 days, the boron-supplemented rats contained 47 percent more glycogen in their livers than the control animals. The authors believe that "maintenance of stores of body fat was favored by liberal supplementation of the low-potassium rations with boron compounds."

Fluorine in milk, plant foods, and foods cooked in fluorine-containing water, H. V. and M. C. SMITH and M. VAVICH (*Arizona Sta. Mimeog. Rpt.*, 77 (1945), pp. 7).—In a series of experimental periods ranging from 2 to 13 days in length, two cows, one Jersey the other Guernsey, were given drinking water containing from as little as 0.2 p. p. m. to as much as 500 p. p. m. of fluorine. Analyses of the milk obtained from these cows showed that there was a small but definite increase in the fluorine content of the milk when NaF was added to the drinking water. In no case, however, did the fluorine content of the milk exceed 0.5 p. p. m. These results suggested that fluorine is not transmitted in toxic quantities to milk even when the lactating cows are drinking water which has a fluorine concentration far above that causing mottled enamel in children's teeth. Water consumption by the cows decreased sharply as the fluorine content of the water reached the higher levels. It was also observed that most of the fluorine ingested by the cows was excreted by the kidneys.

Cereals and legumes were grown on soils treated with CaF up to soil concentrations of fluorine as high as 500 p. p. m., and vegetables were grown in soils treated with NaF up to fluorine concentrations as high as 3,200 p. p. m. The fluorine content of these plants was higher than that of plants grown in control plots receiving no fluorine; however, the amount deposited in the plants was not proportional to the amount in the soil. The amount of fluorine absorbed varied with the type of plant and the part of the plant analyzed. Beets and sweetpotatoes, for example, absorbed more than snap beans and tomatoes, and wheat stalks and leaves more than the wheat grain. Since natural soils contain only traces of fluorine and since the excessively enriched soils produce relatively small increases in the plant fluorine content, it is reasoned that plant foods grown on Arizona soils are not dangerously high in fluorine content.

Vegetables cooked in water containing added fluorine (5 and 24 p. p. m.) absorbed some of the fluorine. "It is not a wise policy, therefore, to cook in fluorine waters cereals, beans, and other dry foods which absorb large amounts of water during the cooking process. Again, although vegetables show relatively small increases in fluorine content as compared to cereals when they are cooked in fluorine waters, it is important that as little fluorine water as possible be used."

The choline content of pure varieties of wheat, oats, barley, flax, soybeans, and milled fractions of wheat, D. GLICK (*Cereal Chem.*, 22 (1945), No. 2, pp. 95-101, *illus. 1*).—The reineckate method previously described (E. S. R., 93, p. 249) was used for the determination of choline. Pure varieties of wheat, oats, barley, flax, and

soybeans grown in known localities were tested. Results show that hard winter, hard spring, and soft winter wheats averaged, respectively, 0.79, 0.91, and 0.88 mg./gm. (dry weight basis). Other average values were oats, 1.14; barley, 1.10; flax, 1.07; and soybeans, 2.37.

Various milling fractions of wheat were also assayed, and it was found that commercial bleaching had no effect on flours of different degrees of extraction.

"In the relationship between the degree of extraction and the percentage of constituent in wheat, a parallelism was observed for choline, as found in the present investigation, and lipid phosphorus. . . . It would appear that all of the choline in wheat exists in the form of lecithin."

It was noted that a large proportion of the total choline and lipid phosphorus is present in the more refined wheat flours.

Nutrition and chemical growth in childhood.—II, Original data, I. G. MACY (*Springfield, Ill.: Charles C. Thomas, 1946, vol. 2, pp. 433-1460+*, illus. 706).—Volume 1 of this study of chemical changes in growth and development (E. S. R., 88, p. 851) details the methods and technics used and presents average data for children. The present volume contains all the facts and figures for each of the 21 normal children (13 boys and 8 girls) who participated in this study by the Research Laboratory of the Children's Fund of Michigan. A foreword by L. Reynolds and a supplement by J. O. Holmes are included. The material presented includes the medical histories and pictures of the 21 subjects; the chemical analyses of the food, feces, and urine for consecutive balance periods over a period of months for the group of children, and for certain of the children at different age levels; anthropometric measurements; hemato-chemical determinations; actual size reproductions of roentgenograms; medical and dental examinations; basal metabolism determinations; and psychometric evaluations. The supplement presents data for 12 normal children collected in the department of home economics, Illinois Experiment Station. An appendix gives comparative values for abnormal children studied by the Research Laboratory of the Children's Fund of Michigan.

Some factors influencing the food intake of preschool children, C. L. JUSTICE, M. L. MATTSON, and C. SCHUCK. (Purdue Univ.). (*Jour. Amer. Dietet. Assoc.*, 22 (1946), No. 2, pp. 128-133).—The food which 26 nursery school children ate at lunch showed that more food was consumed under self service (with the exception of milk) than was consumed under standard service. Data collected for 433 individual lunches showed that for three out of four menus, calorie and protein intakes averaged higher with self service; intakes of these nutrients increased with age. The study included observations on the influence of activity, age, rate of growth, sex, season, and type of diet on consumption. Food intakes of boys per kilogram and per inch exceeded those of girls of the same age. Winter and spring intake averages were smaller than those of the preceding fall, and calorie consumption was higher when the menus contained meat.

Study of the dietary level of 100 families, F. HARDY. (Wash. State Col. et al.). (*Jour. Home Econ.*, 37 (1945), No. 6, pp. 351-355).—Information relative to the nutritive level of the diets of 100 families in Snohomish County, Washington, was obtained by checking the homemaker's records and menus. Thirty-six families met the recommended allowances of the National Research Council for every dietary essential, disregarding preparation and cooking losses of water-soluble and heat-labile vitamins in making calculations. Fourteen families had an intake of less than 75 per cent of the recommended allowance for one or two dietary essentials. More than one-third of the families were below the recommended level of calcium, more than one-fourth in calories and riboflavin, more than one-fifth in niacin, one-sixth in ascorbic acid, and one-tenth in iron and thiamine. Of the 19 farm families studied,

58 percent met recommendations as compared with 60 percent of the 30 other rural families and 69 percent of the 51 city families studied. The families with income levels above \$3,500 a year were found to be divided—half had diets below the recommendation. Of the \$1,500 to \$2,500 and \$2,500 to \$3,500 income groups, about two-thirds of the families had diets below the recommended levels in one or more factors. Home food production improved the diets, especially their calcium and ascorbic acid intakes.

A further analysis of food selection of 80 families in Lubbock, Texas, M. W. LAMB and M. T. CORRINGTON (*Jour. Amer. Dietet. Assoc.*, 22 (1946), No. 2, pp. 134-138).—Dietary quality, income level, and occupation influence the selection and quantity of foods consumed by average families in this community. Conclusions drawn from the study indicated that food selection improved with an increase in family income up to \$4,000 or more. Professional groups made the best food selection in type and variety of the occupation groups studied, which also included labor, skilled trade, and white collar workers. The greatest variation was in selection of protective foods such as fruits, fresh and canned vegetables, whole grain cereals, butter, margarine, and milk.

Seasonal changes in food consumption and rate of growth of the albino rat, H. L. CAMPBELL (*Amer. Jour. Physiol.*, 143 (1945), No. 3, pp. 428-433, illus. 5).—A large number of rats were maintained on the same diet over a period of years. Statistically significant differences in food intake varying with the season were noted—the largest intake being in the winter months and the smallest in the summer months. Over 900 adult rats, 82 to 173 rapidly growing rats 28 to 56 days of age, and separate groups of young male and female rats were studied.

The importance of choosing animals so as to represent all season of the year is emphasized by the author.

Digestibility of human foods and animal feeds as measured by experiments with rats, G. S. FRAPS (*Texas Sta. Bul.* 675 (1945), pp. 19).—"Results of 508 tests of the digestibility of foods and feeds by rats are summarized. The rats digested slightly less protein than did the chickens from all the feeds, but digested a little more protein than did the chickens from human foods. The rats digested less fat but more crude fiber and more nitrogen-free extract than the chickens. The digestibility of protein and of nitrogen-free extract by rats and humans averaged practically the same. Rats digested smaller percentages of fats than the humans on an average."

The food value of a further batch of edibles estimated by chemical methods, K. MITRA and H. C. MITTRA (*Indian Jour. Med. Res.*, 33 (1945), No. 1, pp. 91-95).—This is a continuation of a series of studies by the authors (*E. S. R.*, 92, p. 575) on the proximate composition and Ca and P values of foods utilized in India. This report lists two kinds of grain foods; seven kinds of flesh foods—including immature shrimps, winged white ants, frog, field rat's meat, turtle's egg, and fresh water mussel; five kinds of fruit; nine varieties of mushroom; six leafy vegetables; casein from cow and buffalo milk; as well as nine miscellaneous products such as sugar from cane, date palm, coconut palm, and palmyra palm. Hindi or local names, English names (when available), and Latin names are given.

High calcium values were noted for mussels and immature shrimps.

Biological value of proteins from muscle meat of cow, buffalo and goat, K. MITRA and H. C. MITTRA (*Indian Jour. Med. Res.*, 33 (1945), No. 1, pp. 87-90).—Rats were fed a basic diet of corn starch, sugar cubes, coconut oil, salt mixture, and calcium carbonate. The meat supplements, in the form of a dry powder, were fed at a level necessary to provide 10 or 15 percent protein.

Results showed that at the 10 percent protein level, the biological value of beef muscle meat was superior to both buffalo and goat meat, with values of 68.6, 59.5, and 60.4, respectively. At the 15 percent level, the values were 53.7, 46.4, and 46.7 for the three meats, and the differences were not considered significant.

The relative digestibility coefficient of beef muscle meat was also higher, being 97.3 and 98.4 at the 10 and 15 percent levels, respectively, compared with 94.7 and 97.1 for buffalo meat and 95.2 and 94.2 for goat meat at the comparable protein levels.

The effect of feeding succinylsulfathiazole to rats receiving purified diets high in carbohydrate, protein, fat, or protein and fat, L. D. WRIGHT, H. R. SKEGGS, and K. L. SPRAGUE (*Jour. Nutr.*, 29 (1945), No. 6, pp. 431-439, illus. 2).—Rats were fed a diet high in either carbohydrate, protein, and fat, or both protein and fat, and to which 5 percent succinylsulfathiazole (SST) was added.

The rate of growth, bacterial flora in the feces, and the fecal elimination and liver storage of folic acid, biotin, and pantothenic acid were measured. Results showed the weight gains continued for a longer period of time in rats fed SST in high protein diets than in animals receiving the drug in high carbohydrate or high fat diets. The bacterial flora of the feces was not demonstrably altered in number or kind of organisms by changes in the composition of the diet. The superior condition of the rats ingesting high protein diets showed only slight correlation with the fecal elimination of folic acid, biotin, and pantothenic acid. The inclusion of SST in all the diets was accompanied by a reduction in the hepatic stores of folic acid and biotin—most marked in the rats on the high fat and carbohydrate diets.

Of the determinations made, the hepatic stores of pantothenic acid showed the best correlation with the condition of the animals.

The excretion of pyridoxine, "pseudopyridoxine," and 4-pyridoxic acid in the urine and sweat of normal individuals, B. C. JOHNSON, T. S. HAMILTON, and H. H. MITCHELL. (Univ. Ill.). (*Jour. Biol. Chem.*, 158 (1945), No. 3, pp. 619-623).—Four young adult males were maintained for 8 hr. per day under hot moist conditions for 5 days each week. They were fed a normal diet with or without added pyridoxine (8 mg./day). Analyses were made of sweat and urine for pyridoxine, pyridoxal, and 4-pyridoxic acid.

Results showed that 50 percent of the pyridoxine supplement given orally was recovered in the sweat and urine in one of the three forms tested. On the normal or supplemented diet, 85 percent of the total metabolites excreted in the urine was in the form of 4-pyridoxic acid, 4-4.5 percent as pyridoxine, and 7-8 percent as pyridoxal. Only a small amount of the three metabolites appeared in sweat, but the percentage distribution of these three compounds was similar to that found in urine.

The possible functional form of pyridoxine in the body is discussed. See also a note by Huff and Perlzweig (p. 148).

Effects of methods of blanching, storage, and cooking on calcium, phosphorus, and ascorbic acid contents of dehydrated green beans, M. S. EHEART and M. L. SHOLES. (Va. Expt. Sta.). (*Food Res.*, 10 (1945), No. 4, pp. 342-350).—Landreth Stringless Green Pod bush beans were planted and harvested at four different dates. Five methods of blanching were used: (1) Tap water—18 min.; (2) tap water + NaHSO_4 —18 min.; (3) tap water + NaHSO_4 and Na_2SO_4 —18 min.; (4) steam-blanching—30 min.; and (5) unblanched. After dehydration, samples were stored for 6 mo. in one of four ways: (a) Fruit jars in a refrigerator; (b) cellophane bags in a refrigerator; (c) same as (a) at room temperature; and (d) same as (b) at room temperature. In cooking experiments, the dehydrated beans were boiled 30 min. with or without preliminary soaking.

Under the experimental conditions used, dehydrated beans were found to be as high in phosphorus as raw beans and higher in calcium. However, most of the ascorbic acid had disappeared, since only 6.9 percent of the amount in the raw beans remained in the blanched dehydrated beans after 6 months' storage, and less than 25 percent of the amount in the dehydrated product was retained in the cooked beans.

Greatest factor influencing the vitamin and mineral contents of the raw or dehydrated beans was the date of harvest. Highest values were found in those beans harvested at an early date.

Ascorbic acid, carotene, chlorophyll, riboflavin, and water content of summer squashes. A. D. HOLMES, A. F. SPELMAN, and C. P. JONES. (Mass. Expt. Sta.). (*Food Res.*, 10 (1945), No. 6, pp. 489-496).—Studies were made on seven varieties of summer squash commonly grown in the New England States: (1) Cocozella Vegetable Marrow, (2) Zucchini Grey, (3) Early White Bush Scallop, (4) Early Summer Prolific Straightneck, (5) Early Summer Crookneck, (6) Butternut, and (7) Golden Cushaw. Two samples of (2), and three samples of all the other varieties were assayed.

Vitamin values are reported in milligrams per 100 gm., fresh weight. The highest ascorbic acid value, 16.7, was found in (3), while values averaging between 11.2 and 12.2 were obtained in (4), (5), and (7). High carotene values of 6.21 and 3.31 were found in (7) and (6) respectively, while all the other varieties gave values of 0.36 or lower. Best riboflavin results were found in (7) (0.249), and other squashes showing high values were (1) and (5), with 0.173 and 0.119, respectively.

Moisture content ranged from 84.6 to 95.7 percent, with (7) and (6) containing less than 90 percent moisture, 5 averaging 91.76 percent, and the others between 93.77 and 95.75 percent. Chlorophyll values were high in the green varieties only—being 6.07 and 12.25 in (1) and (2), respectively.

Vitamin retention in quantity cooking of vegetables. B. K. WATT and M. B. ATTAYA. (U. S. D. A.). (*Jour. Home Econ.*, 37 (1945), No. 6, pp. 340-344).—Results from 17 studies on vitamin content of vegetables and vitamin retention after large scale operations are reviewed. Emphasis is placed upon the wide range of values found, the danger of generalization from even a fairly large number of cases, and the need of more information in this field before averages can be established for different methods of food preparation.

The availability of vitamins from yeasts, I-II. (Wis. Expt. Sta.). (*Jour. Nutr.*, 29 (1945), No. 6, pp. 373-389, illus. 1).

I. *The absorption of thiamine by human subjects from various types of bakers' yeast.* H. T. Parsons, A. Williamson, and M. L. Johnson (pp. 373-381).—Several samples of commercial compressed bakers' yeast were tested. Approximately 0.5 to 1.0 mg. of thiamine per cake of yeast was contained in the unenriched samples, and from 30 to 300 times as much in the enriched samples.

Measurements of thiamine intake and output indicated that a large portion of the thiamine ingested in the form of fresh unenriched yeast was excreted in the feces. Boiling the yeast before ingestion produced a lower fecal output and an increased urinary excretion. This was attributed to improved absorption of thiamine from the boiled samples. However, with some of the highly enriched samples of yeast, increased urinary excretion occurred when fresh yeast was consumed. No explanation of this reaction was found. The authors conclude "the differences in the absorbability of the thiamine from various fresh yeasts did not seem to be attributable either to the strain of yeast or to the amount of yeast consumed by the subjects."

II. *The accessibility to rats for growth of the thiamine in various types of bakers' yeast.* H. T. Parsons, A. Foeste, and H. Gilberg (pp. 383-389).—The same yeasts

were assayed biologically with rats. Results showed that the thiamine in fresh yeast was relatively unavailable in low potency yeast. Boiling or treatment with alcohol increased the availability of thiamine in these yeasts.

Two samples of high potency yeasts were nearly as effective sources of thiamine in the fresh as in the treated state. The results of the rat assay were considered to be in good agreement with the tests made on human subjects.

Relative values of carotenes in foods as measured by storage of vitamin A in livers of rats. G. S. FRAPS and W. W. MEINKE. (Tex. Expt. Sta.). (*Food Res.*, 10 (1945), No. 3, pp. 187-196).—Young rats were fed a vitamin A-free purified diet supplemented with various sources of carotene. The amount stored in the liver was assayed as spectro-vitamin A. The average total storage from 60 µg. of carotene per rat per day ranged from 63.4 to 124.1 µg. per liver with an average of 85.9 µg. The foods tested—carrots, sweetpotatoes, turnip greens, spinach, pumpkin, apricots, beet greens, alfalfa, liver, and butterfat—were assayed in terms of their beta-carotene equivalent. Liver storage values for the vegetables ranged from 16 to 64 percent (average 32 percent), while for beef liver and butterfat, the values were 179 and 145 percent, respectively, of that of carotene in oil. Cottonseed oil, added to the basal ration or directly to the supplement, increased the utilization of carotene from a value of 21 percent to 44 percent for the foods tested. The addition of tocopherol to spinach or pumpkins did not increase the storage of vitamin A in the livers, according to the experiments carried out by the authors. Twenty-four references are listed.

Constituents of crude carotene of carrots. A. R. KEMMERER and G. S. FRAPS. (Tex. Expt. Sta.). (*Food Res.*, 10 (1945), No. 6, pp. 457-460).—Fresh and dehydrated carrots from various localities were assayed for crude carotene and β -carotene equivalents according to the method of Kemmerer and Fraps (E. S. R., 91, p. 243). Fourteen known and several unidentified varieties were studied.

In fresh carrots, crude carotene values ranged from 386 to 1,120 p. p. m. (dry weight basis); in dehydrated carrots values ranged from 165 p. p. m. (for samples dehydrated in 1941) to 942 p. p. m. The β -carotene content varied from 42.1 to 73.3 percent, α -carotene from 19.5 to 42.2 percent, and β -carotene equivalent from 60.1 to 83.6 percent of the crude carotene values. In general, β -carotene averaged roughly 55 percent, and α -carotene approximately 30 percent of the total crude carotene present in the carrots.

The vitamin A content of Arizona butter. H. FARRANKOP (*Arizona Sta. Mimeog. Rpt.* 74 (1945), pp. 3).—This phase of the Arizona study (E. S. R., 91, p. 486), conducted as part of the National Cooperative Study on the vitamin A content of butter, involved analyses of 25 samples of market butter manufactured in Arizona. The samples obtained at intervals from December 1943 through May 1945 were found to contain from 14,754 to 19,880 International Units of vitamin A per pound, with an average of 17,457. These uniformly high values (as compared with the values of 9,974 to 13,058 International Units per pound obtained for 4 samples of nationally distributed brands analyzed in the course of the study) are attributed to the fact that green pasture for the cows is available throughout the year under Arizona climatic conditions.

The B vitamin content of raw and cooked sweet potatoes. P. B. PEARSON and R. W. LUECKE. (Tex. Expt. Sta.). (*Food Res.*, 10 (1945), No. 4, pp. 325-329).—Four varieties of sweetpotatoes obtained from three States were studied. Two varieties, Nancy Hall and Porto Rico, were deep yellow and the other two, Triumph and W. M. 3, were very light in color. With the exception of nicotinic acid, which seemed to run higher in the more pigmented varieties, no varietal differences were noted in the distribution of the other B vitamins. In general, the raw sweetpotatoes

averaged 1.39, 0.46, 5.56, and 10.95 $\mu\text{g./gm.}$ of thiamine, riboflavin, nicotinic acid, and pantothenic acid, respectively.

Cooking tests included baking in an oven at 204.4° C. (400° F.) and boiling. In both tests the potatoes were cooked with their skins on. The baked potatoes lost an average of 16.7 percent of their weight, while the boiled potatoes gained an average of 4.9 percent in weight. Results showed that "sweetpotatoes cooked by baking retained 75.5 percent of the thiamine, 88.6 percent of the riboflavin, 85.1 percent of the nicotinic acid, and 76.8 percent of the pantothenic acid. There was less loss of the vitamins when the potatoes were cooked by boiling. Boiled sweetpotatoes retained 92.3 percent of the thiamine, 103.2 percent of the riboflavin, 100.6 percent of the nicotinic acid, and 99.9 percent of the pantothenic acid.

"The riboflavin, nicotinic acid, and pantothenic acid contents of sprouts and the sprouted sweetpotatoes were essentially as high as for unsprouted potatoes, while for thiamine the values were somewhat lower."

Stability of B vitamins in grape juices and wines, L. PERLMAN and A. F. MORGAN. (Univ. Calif.). (*Food Res.*, 10 (1945), No. 4, pp. 334-341).—Experimental juices and wines were prepared from Burger grapes. To some of the wines, varying amounts (75 to 250 p. p. m.) of SO_2 were added either before or after fermentation. Half of the samples were fortified with thiamine, riboflavin, pyridoxine, and pantothenic acid. Samples were stored in clear or dark bottles, in the light at room temperature, and in the refrigerator (40° to 50° F.). Tests were made at 1 and 10 mo. after storage.

Results showed that all of the added vitamins, with the exception of riboflavin, were retained in the wines. Riboflavin was largely destroyed in the clear bottles held in daylight.

Riboflavin and pantothenic acid assays were also made on 11 kinds of aged commercial wines. Values for riboflavin ranged from 6 to 21 $\mu\text{g./100 gm.}$, and for pantothenic acid 7 to 45 $\mu\text{g./100 gm.}$

Self-selection studies on coprophagy as a source of vitamin B complex, C. P. RICHTER and K. K. RICE (*Amer. Jour. Physiol.*, 143 (1945), No. 3, pp. 344-354, illus. 4).—Rats were fed a self-selection diet in which all components of the B complex were either absent or provided for by dried brewer's yeast or dried liver powder or feces collected from normal adult rats.

In the absence of the B complex, loss of weight was rapid, and changes in food selection occurred so that fat was substituted for most of the carbohydrate and protein previously eaten.

Comparisons of growth rates showed that the needed vitamin B complex was supplied equally well by the feces consumed (4.5 gm.) as by the brewer's yeast supplement (2.2 gm.). This amount of feces corresponded to the daily output of 2 to 4 normal adult rats. On the dried liver supplement (2.2 gm.), growth was somewhat slower and certain rats were repelled by the bitter taste. The authors conclude "that for at least 40 to 50 days feces satisfactorily replaced all the components of the vitamin B complex found in yeast or liver powder."

The absence of any bitter or toxic substance in the feces is adduced from the fact that large amounts were consumed over a long period of time with no visible ill effects.

Thiamine, riboflavin, and nicotinic acid retention in preparation of overseas hams and bacons, H. P. SARETT and V. H. CHELDELIN, (Oreg. State Col. et al.). (*Jour. Nutr.*, 30 (1945), No. 1, pp. 25-30).—Heavily salted overseas hams and bacons were studied at different stages of preparation—as received, after soaking, and after cooking. The vitamin values were determined by microbiological methods. Thiamine values for whole ham, sliced ham, and bacon were, respectively, 10.1, 10.8, and 3.3

μg./gm. as received; 9.5, 6.2, and 1.7 μg./gm. after boiling; and 8.5, 9.7, and 2.7 μg./gm. after frying. Riboflavin values for the same three samples were 2.5, 2.4, and 1.0 as received; 2.2, 2.0, and 0.75 after boiling; and 2.5, 2.9, and 2.85 after frying. The nicotinic acid content ran from 31.1, 25.5, and 12.6 in the three samples as received; 30.5, 14.4, and 5.5 after soaking; and 35.3, 18.4, and 14.7 μg./gm. after frying. Bacon drippings accounted for 56 percent of the weight of the raw sample, but contained only 8.4 percent of the total nicotinic acid present and no thiamine or riboflavin.

"Average retentions of thiamine, riboflavin, and nicotinic acid after soaking and boiling of whole hams were 72, 79, and 79 percent, respectively. Subsequent frying reduced the remaining vitamins to 55, 67, and 68 percent, respectively, whereas after baking the comparable figures were 50, 79, and 71 percent. . . .

"Soaking of sliced ham left only 59, 85, and 58 percent, respectively, of the original thiamine, riboflavin, and nicotinic acid contents. Retentions after frying these slices were 47, 78, and 52 percent, while after baking 47, 68, and 47 percent, respectively, of the thiamine, riboflavin, and nicotinic acid were found.

"The losses of these vitamins on soaking of overseas bacon were large, leaving only 52, 78, and 42 percent of the original thiamine, riboflavin, and nicotinic acid. The amounts of these vitamins remaining after frying were 20, 72, and 30 percent, respectively."

The riboflavin content of tea and some results for the pantothenic acid content, E. A. M. BRADFORD and E. B. HUGHES (*Analyst*, 70 (1945), No. 826, pp. 2-5).—Riboflavin and pantothenic acid were assayed by microbiological methods. Tea infusions, corresponding to the way tea is usually prepared for drinking, were found unsatisfactory for riboflavin assay because of interfering substances present. A creaming procedure is described in which the interfering polyphenols were precipitated by a 2 percent solution of caffeine. Tabulated data are presented on 19 tea samples obtained from different countries and of various blends. Riboflavin values range from 6 to 11 μg./gm. and pantothenic acid from 15 to 40 μg./gm. of tea. The authors calculate that on the basis of 2.0 to 2.5 gm. tea (1 teaspoonful) per cup of infusion, approximately 25 μg. and 75 μg. of riboflavin and pantothenic acid, respectively, can be supplied exclusive of the amounts derived from any milk added.

The nicotinic acid content of tea, E. B. HUGHES and T. L. PARKINSON (*Analyst*, 70 (1945), No. 828, pp. 86-87).—Seven of the same tea samples previously assayed for riboflavin and pantothenic acid (see above) were assayed for nicotinic acid by the method of Wang and Kodicek (*E. S. R.*, 92, p. 758). Values ranged from 56 to 94 μg./gm.—averaging about 72 μg./gm.

Nicotinamide methochloride and its fluorescent derivatives, P. ELLINGER (*Nature [London]*, 155 (1945), No. 3933, pp. 319-322).—A comprehensive review of the literature on the subject is presented including a discussion of the possible interpretations of the various conflicting results obtained (48 references are listed).

The thiamine and riboflavin content of the grain and flour of certain varieties of Kansas-grown wheat, D. E. WHITNEY, H. HERREN, and B. D. WESTERMAN. (Kans. Expt. Sta.). (*Cereal Chem.*, 22 (1945), No. 2, pp. 90-95).—Experimentally grown Turkey, Chiefkan, Blackhull, Pawnee, Comanche, and Tenmarq varieties of wheat from the 1941 and 1942 crops were assayed for thiamine and riboflavin. Nebred wheat was also assayed from the 1942 crop, while riboflavin assays only were made on similar samples from the 1943 crop and on one additional sample—Blackhull X Tenmarq. Experimentally milled long patent flours of 70 percent extraction, with a moisture content of approximately 15 percent and an ash content of about 0.42 percent, were prepared from most of the wheat samples.

Thiamine values found ranged from 3.99 to 5.45 $\mu\text{g./gm.}$ in the wheat and from 0.82 to 1.50 $\mu\text{g./gm.}$ in the flour. Thiamine retention in the flour was calculated to be about 12 to 25 percent of that in the original wheat.

Riboflavin values over the 3-yr. period ranged from 1.00 to 1.69 $\mu\text{g./gm.}$ in the wheat and from 0.65 to 0.96 $\mu\text{g./gm.}$ in the flour. Retention in the flour was calculated to be approximately from 30 to 54 percent. Riboflavin values ran consistently lower for the 1943 wheat samples tested than for the previous 2-yr. samples (1.00 to 1.45 v. 1.25 to 1.69).

Observations on thiamin content of stored wheat, E. G. BAYFIELD and W. W. O'DONNELL. (Kans. Expt. Sta.). (*Food Res.*, 10 (1945), No. 6, pp. 485-488).—A study was made of the thiamine content of a number of wheats stored for periods ranging from 5 mo. to 51 yr. Values ranged from 0.29 $\mu\text{g./gm.}$ to 4.19 $\mu\text{g./gm.}$ for the samples stored for more than 10 yr.

Experimental samples were stored under normal (13 percent) and high (15 percent) natural moisture conditions with and without ethylene treatment. Results indicated that significant losses of thiamine occur on storage. Greatest losses occur under abnormal storage conditions of high moisture with consequent high temperature.

Nuevas valoraciones de vitamina C en alimentos Mexicanos [New values for vitamin C in Mexican foods], F. GIRAL and L. M. DE LA TORRE (*Ciencia [Mexico]*, 6 (1945), No. 9-12, pp. 252-254).—In a continuation of the earlier studies of Giral and Viesca Viesca (*E. S. R.*, 90, p. 279), 17 foods not previously reported have been assayed for ascorbic acid. Tabulated data include common and scientific names, parts of plant assayed, and the reduced and total ascorbic acid value in milligrams per 100 gm. fresh and dry weight. Comparisons are made with other reported values; and 24 references are listed including several in German and Spanish.

A note on the production of vitamin C by sprouting seeds, L. P. V. JOHNSON, G. A. YOUNG, and J. B. MARSHALL (*Sci. Agr.*, 25 (1945), No. 8, pp. 499-503, illus. 1).—Of 31 varieties of legumes and cereals originally studied, only 17 showed adequate germination or ascorbic acid content to warrant further investigation. Tests made at 15.6, 22.2, and 28.9° C. showed the lowest temperature to give the best results. Only five legumes produced sprouts with ascorbic acid values over 15 mg./100 gm. Sprouting times, with maximum vitamin C production at 15.6°, were Chinese salad bean 3 days, 23 mg./100 gm.; English Broad Windsor bean 7 days, 33 mg.; Arthur pea 5 days, 17 mg.; O. A. C. No. 181 pea 5 days, 18 mg.; and Early Blue, Ottawa No. 21 5 days, 20 mg./100 gm.

Effect of steam and hot-water blanching on ascorbic acid content of snap beans and cauliflower, J. L. RETZER, F. O. VAN DUYN, J. T. CHASE, and J. I. SIMPSON. (Univ. Ill.). (*Food Res.*, 10 (1945), No. 6, pp. 518-524).—Stringless Black Valentine snap beans and an unidentified variety of cauliflower were studied over a 2-yr. period. Bean samples weighing 240 gm. were blanched 4½ min. in steam, or 3 min. in 8 qt. of boiling water. Cauliflower samples (275 gm.) were blanched 5½ min. in steam, or 4 min. in 11 qt. boiling water. After cooling, the samples were quick frozen at -24° to -30° C., and after 16-24 hr. stored at -17.8°. Twelve to 20 determinations were made at each stage of the processing, using small samples for each test.

Ascorbic acid values are reported in terms of milligrams per gram edible portion as determined. In the raw beans, values ranged from 0.18 to 0.20 and in cauliflower from 0.81 to 0.90. After blanching, cooling, and freezing, the ascorbic acid content of beans ranged from 0.16 to 0.17, and of cauliflower, from 0.62 to 0.70. The method of blanching did not significantly influence the results. Progressive loss of ascorbic acid occurred in both vegetables on storage. After 9 mo. of freezer storage, the

snap beans and cauliflower had lost approximately 50 to 70 percent of their original total ascorbic acid.

Effects of different methods of cooking on the ascorbic acid content of cabbage, I. NOBLE and E. WADDELL. (Minn. Expt. Sta.). (*Food Res.*, 10 (1945), No. 3, pp. 246-254).—Three varieties of cabbage, Marion Market, Danish Ballhead, and Wisconsin Ballhead Yellow Resistant, were tested over a 2-yr. period. Using 240 gm. of shredded cabbage, comparisons of five cooking methods were made: (1) Boiling in excess (960 cc.) water in an open kettle; (2) boiling in excess water (480 cc.) in a loosely covered kettle; (3a) cooking in a minimum amount of water (30-60 cc.) in a tightly covered kettle; (3b) same as (3a), using 60-90 cc. of water; (4) cooking in 60 cc. water in a pressure saucepan; and (5) steaming. Cooking time for each method was experimentally determined, as it was found to vary with the method used as well as the variety or lot of cabbage used.

Results are reported on the first two varieties only. Best color retention and mildest odor were noted with method (1). Strong odor and off-color results occurred with (3a), (3b), and (5), while similar results were found with (4) when the cooking time exceeded 3 min.

Freshly gathered Marion Market and Danish Ballhead cabbages averaged, respectively, 36.2 and 46.9 mg. ascorbic acid per 100 gm. fresh vegetable in 1943, and 40.4 and 44.9 mg./100 gm. in 1942. Considerable unexplainable variation in the percentage retention of ascorbic acid was noted with each method of cooking. Statistical analyses of the data indicated that methods (3), (4), and (5) were most efficient in retaining the ascorbic acid in cabbage (averaging 67 and 46 percent retention for Marion Market and Danish Ballhead, respectively), while the open-kettle method averaged 34 and 30 percent retention for the two varieties, respectively.

Ascorbic acid content of okra as affected by maturity, storage, and cooking, M. E. HOLLINGER and D. COLVIN. (La. State Univ.). (*Food Res.*, 10 (1945), No. 3, pp. 255-259, illus. 1).—Two similar varieties of okra were studied—Louisiana Green Velvet and Louisiana White Velvet. Ascorbic acid values were found to be highest (average—42 mg. per 100 gm. moist weight) in the young immature pods $2\frac{1}{2}$ to 3 in. long and lowest (average—16 mg./100 gm.) in the fully mature pods 10 to $10\frac{1}{2}$ in. long. Most samples for the storage and cooking tests were harvested when 5 to $5\frac{1}{2}$ in. long. Losses of ascorbic acid on storage 24 and 48 hr. at room temperature (27.8° to 30° C.) averaged 36 and 54 percent, respectively, on a moist-weight basis. Storage in the refrigerator (3.3° to 4.4°) showed 100 and 92 percent retention of ascorbic acid for the same period.

Cooking methods studied included boiling the whole or sliced okra in variable amounts of water or in tomato juice, frying the sliced pods, and cooking whole pods 2 min. in a pressure saucepan. Best retention of ascorbic acid (82.2 percent) was obtained by the last method. Retention by the other methods used ranged from 44.5 to 75 percent, with the higher results occurring when tomato juice or a minimum amount of water was used.

Vitamin C in Nebraska potatoes, H. O. WERNER (*Better Potatoes in Nebr.*, 8 (1945), No. 1, pp. 2-6).—Nebraska potatoes were analyzed for their ascorbic acid content, and results showed that some varieties were superior to others; potatoes from green vines are superior to those from mature or dead plants; and straw-mulched or dryland potatoes have higher values than nonmulched or irrigated potatoes. The amount of ascorbic acid in all potatoes decreased rapidly during storage but more rapidly at low than at high storage temperatures.

Some factors affecting the ascorbic acid content of tomatoes, J. P. MCCOLLUM. (Univ. Ill.). (*Amer. Soc. Hort. Sci. Proc.*, 45 (1944), pp. 382-386).—Four strains of tomatoes were experimentally grown and tested. Results showed that no consistent

relationship could be found between ascorbic acid content, total solids, and sugar content. The amount of sunlight on the fruit was the most important factor regulating ascorbic acid production. The need of carefully selected fruits in relation to their exposure to sunlight, and of sampling the whole fruit or sectors taken from opposite angles of each fruit when making ascorbic acid assays, is emphasized. Dense foliage definitely inhibited ascorbic acid production.

Seasonal changes in the ascorbic acid concentration of Florida grapefruit, P. L. HARDING. (U. S. D. A.). (*Amer. Soc. Hort. Sci. Proc.*, 45 (1944), pp. 72-76).—A comprehensive study of the many factors affecting the ascorbic acid value of Florida grapefruit, including the effect of seasonal changes, has been reported elsewhere (E. S. R., 93, p. 291). The present report assembles information on the ascorbic acid content of grapefruit as affected by seasonal conditions, variety, root-stock, location of the grove, cultural practices, and size and maturity of the fruit.

Nutritive value of canned foods.—VII [a], Effect of commercial canning and short-time storage on ascorbic acid content of grapefruit juice, J. R. WAGNER, M. IVES, F. M. STRONG, and C. A. ELVEHJEM. (Wis. Expt. Sta.). (*Food Res.*, 10 (1945), No. 6, pp. 469-475).—This special study on grapefruit juice is part of a more complete cooperative study on canned foods in general (E. S. R., 94, p. 397).

The effect of commercial canning practice on the ascorbic acid content of grapefruit juice was studied at 12 canneries in the Rio Grande Valley. Results were in good agreement with those previously obtained by Moore et al. (E. S. R., 94, p. 409) and Ross (E. S. R., 92, p. 453). Retention of vitamin C ranged from 92.2 to 99.6 percent and averaged 96.7 percent for all plants. After 40 days' storage at about 72° F., an average of 91.3 percent of the ascorbic acid found in the freshly canned juice was still retained.

The vitamin C content of guavas, H. J. WEBBER. (Calif. Citrus Expt. Sta.). (*Amer. Soc. Hort. Sci. Proc.*, 45 (1944), pp. 87-94).—Published and unpublished data from several sources have been tabulated to present additional evidence of the extraordinary richness of guava fruits in ascorbic acid.

Acute and chronic ascorbic acid deficiencies in the Rhesus monkey, J. H. SHAW, P. H. PHILLIPS, and C. A. ELVEHJEM. (Wis. Expt. Sta.). (*Jour. Nutr.*, 29 (1945), No. 6, pp. 365-372, illus. 2).—The animals were fed a purified diet composed of 74 percent sucrose, 18 percent washed casein, 4 percent salt mixture, and 4 percent cottonseed oil; 3 percent of a 1 : 20 liver extract was added at the expense of the entire ration. Vitamin supplements consisted of thiamine, riboflavin, pyridoxine, calcium pantothenate, nicotinic acid, inositol, *p*-aminobenzoic acid, and vitamin D fortified halibut-liver oil. Control animals received in addition 7.5 mg. of ascorbic acid per kilogram of body weight per day.

The monkeys on the ascorbic acid-free diet developed an acute deficiency in 30 to 50 days. Symptoms observed were: Gradual loss of about 10 percent body weight over a 2-week period, followed by more rapid loss of weight, loss of appetite, and roughening of the fur without loss of hair. Tenderness in the leg joints was evident. No gingival changes could be observed.

Chronic ascorbic acid deficiency was induced by the addition of 0.25 mg. of ascorbic acid per kilogram body weight per day, and other symptoms appeared. Gingival lesions occurred with necrosis of the gums, alveolar resorption, and in some cases a high incidence of caries. Tenderness and swelling of the joints was more pronounced, and bone resorption occurred at the bone-cartilage junctions, especially at the end of the long bones in the legs. An extensive loss of hair and dermatitis which occurred could be prevented by the addition of biotin to the diet.

The authors conclude "these data indicate that the signs of acute and chronic ascorbic acid deficiencies in the monkey are distinctly different. They may partially

explain the differences observed in experimentally produced and spontaneous scurvy in man."

Blood regeneration in pyridoxine-deficient rats. A. KORNBERG, H. TABOR, and W. H. SEBRELL (*Amer. Jour. Physiol.*, 143 (1945), No. 3, pp. 434-439).—Compared with pyridoxine-fed litter mates, pair-fed pyridoxine-deficient rats occasionally develop a moderate degree of anemia. This can be exaggerated by repeated hemorrhage. In recovery periods of 2, 4, 6, 10, and 22 days following the third hemorrhage, impaired erythropoiesis is evident in the pyridoxine-deficient animal. The addition of folic acid to the diet improves the blood picture in both the pyridoxine-supplemented and pyridoxine-deficient animals, but does not materially alter the relative values in the two groups. The erythropoietic inadequacy of the deficient animals is prevented by pyridoxine even when the administration (100 µg. daily) is begun only 2 days before the start of hemorrhage.

TEXTILES AND CLOTHING

How the war affected civilian textiles. B. V. MORRISON, H. M. FLETCHER, P. B. MACK, E. C. MORSE, E. L. PHELPS, and E. E. SROUT. (U. S. D. A. coop. Pa. State Col., Tenn., Minn., and Wash. Expt. Stas., et al.). (*Jour. Home Econ.*, 38 (1946), No. 1, pp. 21-30).—This study was initiated in 1944 to determine the quality of war-time fabrics which consumers found on retail markets in five sections of the country. Confining purchases to 5 types of staple cotton materials, 5 types of commonly used rayon fabrics, and 4 types of wool and part-wool materials, a representative of the U. S. D. A. Bureau of Human Nutrition and Home Economics bought 3 fabrics of each of the 14 types of materials to represent the best, medium, and poorest qualities.

Most fabrics sold as gabardine were found to be jeans or "middy" twills; salespeople often misrepresented the type and fiber content of fabrics. Gingham showed fewer warp and filling yarns to the inch than did peacetime gingham of similar weights, the counts averaging 77 and 87 warp and 58 and 72 filling yarns per inch for the respective periods. The wartime chambrays purchased in Minnesota and the District of Columbia had a sufficiently high average warp and filling breaking strength for good wear. Several of the poorest quality chambrays had few yarns per inch in one direction or other. Few good quality percales were found; only one material approximated an 80-square. Before the war, the prices paid for percales in six northeastern states varied between 12 and 29 ct. (1941) compared to 19 and 85 ct. per yard in 1944. The amount of sizing in cotton fabrics varied; eight of the chambrays studied had less than 5 percent, while some had over 10 percent of non-fibrous material; gingham ranged from 1 to 17 percent; percales contained 5 percent or more. Few of the 1944 cotton fabrics held their color satisfactorily when they were washed, exposed to light, or wet with perspiration. The effect of laundering on the cotton fabrics varied from stretching 1 to 3 percent (broadcloths and gabardines) to 10 percent shrinkage in the gingham.

Rayons were found generally more plentiful and comparable to prewar fabrics than were the cottons. The color fastness to light, washing, perspiration of practically all rayon fabrics was poor.

In general, the breaking strength of the all-wool fabrics was comparatively low, with a low nonfibrous content. Twenty-nine of the wool and wool-mixed fabrics faded by mild washing, and more than half faded badly by exposure to a carbon arc light for 80 hr.

Effects of temperature and humidity on cellulosic materials with special reference to tire cord. J. M. MCNEILL (*U. S. Dept. Agr., Libr. List 24 (1946) pp. 9*).—Lists of 41 annotated references and 14 patents are included.

Simple improvements increase capacity of Colorado A & M wool laboratory, E. BERTONE (*Colo. Farm Bul. [Colorado Sta.], 7 (1945), No. 6, pp. 12-13, illus. 1.*).—Use of mesh cotton laundry bags instead of screen bottom trays saved two-thirds the time needed to scour a wool sample, and pretreating the dusted wool in water before scouring resulted in an estimated saving of one-third in soap.

New ideas for clothing make-overs, C. L. SCOTT. (U. S. D. A.). (*Jour. Home Econ., 37 (1945), No. 9, pp. 550-553, illus. 3.*).—Suggestions are made for using knit goods, leather, and fur in made-over garments.

HOME MANAGEMENT AND EQUIPMENT

Postwar equipment, A. E. BARAGAR. (Nebr. Expt. Sta.). (*Jour. Home Econ., 38 (1946), No. 1, pp. 11-15.*).—This discussion, based on market surveys, points out that the first equipment appearing on the market after war shortages will resemble prewar models, as manufacturers can furnish these models more rapidly by using their prewar machinery. Emphasizing that the home economist should be ready to give counsel on when to buy and suggestions as to who should buy, the author considers equipment of the future in terms of the consumer's designs and needs.

If you're shopping for home equipment, A. E. BARAGAR, E. KNOWLES, E. C. MCCracken, L. J. PEET, P. B. POTTER, G. M. REDFIELD, and E. and L. SATER. (U. S. D. A. et al.). (*Jour. Home Econ., 38 (1946), No. 3, pp. 137-148.*).—This symposium is a shopping guide for refrigerators, home freezers, washing machines, kitchen ranges, electric roasters, mixers, toasters, coffee makers, pressure cooker saucepans, pressure cookers, electric irons, and vacuum cleaners.

Planning the kitchen, M. BUDOLFSON. (Coop. U. S. D. A.). (*Iowa Sta. Bul. P77 (1945), pp. 557-575, illus. 14.*).—Suggestions are made for improving kitchens by rearranging equipment, changing storage arrangement, adding new equipment, and making structural changes which involve rebuilding of the room. Plans for arrangements of U-shape, L-shape, and corridor-shape kitchens are illustrated. Working heights, preparation units, sink units, and china and cooking utensil storage plans are recommended for arranging cabinets conveniently for tasks to be done and equipment to be used.

Fifty farm kitchens, C. FITZSIMMONS and N. L. PERKINS. (Univ. Ill.). (*Jour. Home Econ., 37 (1945), No. 9, pp. 567-570.*).—A study of kitchen arrangements used by 50 Illinois farm families was made to determine the types of activities carried on there, the kinds of equipment used, and the suitability of the rooms for the activities. Fourteen distinct types of activity were found, including dining, resting, laundering, playing, dressing, preparation of produce for market, and bathing, which were in addition to the food preparation activities. The smallest number of activities carried on in any kitchen was 4 and the largest 18. The home owner families showed the highest average score and the narrowest range in the analyses made of the provisions for performing activities in the kitchens, although families of hired men showed about the same range and average score as the owners who adjusted to the homes in which they lived without making changes.

Relation of posture to fatigue in ironing, E. E. KNOWLES (*Jour. Home Econ., 37 (1945), No. 9, pp. 584-587, illus. 4.*).—Twenty-three homemakers were studied in order to determine what factors were responsible for fatigue caused by ironing. Films taken of 11 women were analyzed by projecting the images on polar co-ordinate paper to calculate the "angle of bend." The study revealed that ironing at the standard 31-in. board height increased the angle-of-bend from 18 to 149 percent above that when preferred heights were used. Standard physiological testing devices, a specially designed cardi tachometer, and mechanical platforms were used

to determine whether metabolic, respiratory, heart rates, or other body processes were affected by posture. The women who ironed at the 31-in. height showed a rate of increase above those shown when ironing at preferred heights; force exerted rose from 2.4 to 48 percent; weight distribution and postural shifting, from 0 to 2 percent; caloric requirements, from 14 to 32 percent; heart rate, from 28 to 30 percent; pulmonary ventilation, from 10 to 51 percent; and blood pressure, from 2 to 21 percent.

The author concludes that "body height cannot be the criterion for the selection of a working height."

REPORTS AND PROCEEDINGS

Fifty-eighth Annual Report of the Vermont Experiment Station [1945], J. E. CARRIGAN. (Partly coop. U. S. D. A. et al.). (*Vermont Sta. Rpt. 1945*, pp. 9-35, illus. 5).—This report, compiled and edited by M. F. Lavallard as a part of Annual Report No. 1 of the College of Agriculture, University of Vermont, includes a summary of the work done on each project during the year, including data on soils and fertilizers as to the value of sawdust and shavings as bedding material for cattle, boron need in Vermont soils, and phosphorus fixation and availability; pasture and hay crops, including genetics studies with zigzag clover and other legumes, effect of climatic factors and breeding studies on pasture grasses and clovers, influence of seed mixtures and fertilizers on pastures, maintenance of permanent haylands, effect of hay-drying methods on conservation of carotene and grade of hay, soil erosion studies, value of birdsfoot trefoil, and chemical weed killers; cultivated crops, including studies of potato scab and potato leafroll, fertilization of field beans and silage corn, and tests of varieties of lima beans, edible soybeans, and sweet corn, field corn, field beans, soybeans, and oats; woodland crops, including factors affecting sap flow and sugar content of sugar maple trees and logs; dairying, including insulation in dairy barns, effect of method of feeding and prolonged use of colostrum on calves, methods of detecting mastitis infection, and fluctuation in the weight of dairy cattle; farm management and agricultural economics, including data on the business management of Vermont towns, and factors affecting land use in Vermont; and home management, including saving time in housework.

Ontario Agricultural College and Experimental Farm, Guelph, Ontario—Report of the President for the year ending March 31, 1945, G. I. CHRISTIE (*Ontario Agr. Col. and Expt. Farm Ann. Rpt.*, 70 (1944), pp. 97, illus. 38).—In addition to administrative data, this report notes progress in studies on silage corn harvesting cost, use of cobalt sulfate to cure wood chewing by calves, inheritance of hernia in pigs and relation of length and shape of face to thickness of back fat, pasture capacity, riboflavin content of eggs, hoof-and-horn meal for poultry, metabolism of tyrosin by chicks, pullorum organisms in eggs, effect on bacteria of adding tomato juice in canning non-acid vegetables, storage rot of potatoes, control of water-core in turnips, tests of fungicides for apples and potatoes, sprays for poison-ivy, soil management, plow-sole applications of fertilizers, mineral and vitamin values of Canadian cheese, control of moisture in cheese and butter and of color defects in butter, tests of DDT and hexachlorobenzene, control of turnip aphid, improvement of wheat, barley, and potatoes, storage of vegetables and apples, varieties of squash for freezing, linseed meal for poultry, and magnesium in poultry rations.

MISCELLANEOUS

Available bibliographies and lists (*U. S. Dept. Agr., Libr. List 25 (1946), pp. 3*).

Colorado Farm Bulletin [September-October, November-December 1945] (*Colo. Farm Bul. [Colorado Sta.], 7 (1945), Nos. 5, pp. 15, illus. 16; 6, pp. 15, illus. 7*).—In addition to articles noted elsewhere in this issue, No. 5 contains *More Sugar Beets, Wheat, Barley, and Vegetables—Colorado's Postwar Goal*, by R. T. Burdick (pp. 2-3, 11); *Experimental Results with DDT*, by G. M. List (pp. 4-5, 14); *Facts About DDT*, by M. G. Payne (p. 5); and *Possibilities of Profit From Winter Feeding—Big Meat Demand Important Factor*, by R. T. Burdick (pp. 10-11).

Mississippi Farm Research [January 1946] (*Miss. Farm Res. [Mississippi Sta.], 9 (1946), No. 1, pp. 8, illus. 2*).—In addition to several articles noted elsewhere in this issue and the usual weather notes, this number contains *The National Livestock Situation*, by D. W. Parvin (p. 1); *Branch Station Expansion Program* (pp. 1, 7), previously noted (*E. S. R., 94, p. 847*); *Tests of Corn Hybrids and Varieties in Mississippi*, by R. C. Eckhardt, W. A. Douglas, and A. L. Hammer (pp. 1, 2-3), also to be published as a station bulletin; *Bedding Sweetpotatoes in Relation to Planting Requirements*, by W. S. Anderson (pp. 1, 3); *Soybean Varieties and Dates of Planting*, by P. R. Henson and R. B. Carr (pp. 4-5, 6, 7), also to be published as a station bulletin; *Bloat in Cattle*, by J. W. Scales (pp. 1, 7); and *Phosphate for Late-Planted Cotton*, by J. L. Anthony (p. 8), in which results for a single season indicated that "should cotton be planted as late as June 1, it would not be a bad idea to increase phosphate applications over those that might have been used under cotton planted at an earlier date."

Bimonthly Bulletin [January-February 1946] (*North Dakota Sta. Bimo. Bul. 8 (1946), No. 3, pp. 43*).—In addition to articles noted elsewhere in this issue, a review of Wyoming Station Bulletin 273 (*E. S. R., 94, p. 463*), and miscellaneous notes, this number contains *Oats Rusts in 1945*, by T. E. Stoa (pp. 30, 32); *North Dakota Farm Prices*, by P. V. Hemphill (pp. 40-42); and *Research Achievements*, U. S. Department of Agriculture (pp. 42-43).

NOTES

California University and Station.—Dr. Robert L. Usinger, assistant professor of entomology and assistant entomologist, has returned from service with the malaria control work of the U. S. Public Health Service and has been assigned to headquarters at Berkeley.

Purdue University and Indiana Station.—Following the diversion of part of the poultry farm to campus expansion, a farm of 130 acres about 2.5 miles distant has been purchased for research with chickens and turkeys.

Recent appointments include in chemistry Dr. Edwin T. Mertz as assistant professor and in veterinary science Drs. Floyd V. Washko and Harold D. James for research in swine diseases.

Maine University and Station.—According to a note in *Poultry Science*, Dr. Thomas G. Culton of the Louisiana Station has been appointed assistant professor of poultry husbandry and assistant poultry husbandryman in the station. Cecil E. Howes has been appointed instructor in poultry husbandry.

Maryland University and Station.—Dr. Charles H. Mahoney has resigned as head of the department of horticulture to engage in commercial work.

Michigan College and Station.—A tract of 227 acres of rolling land near Tipton in southeastern Michigan has been given to the college by H. A. Fee of Adrian together with the income from an endowment for its maintenance. The tract is known as Hidden Lake Gardens and has been extensively improved with greenhouses, a rock garden, and a large amount of plant material. Clarence H. Hoxsie has been appointed superintendent.

Other recent endowments include \$5,000 for research on the spearmint and peppermint industry, \$1,350, for research on the value of the addition of dried baker's yeast to cereal products, \$1,000 for research on turkeys, \$500 from the American College of Dentists for continuance of the studies of tooth decay in rats, and \$300 for studies on fungicides.

Washington College.—Dr. Gale H. Conner has been added to the staff in veterinary medicine.

Wisconsin University and Station.—Leonard A. Salter, Jr., associate professor of agricultural economics and assistant agricultural economist since 1940, and secretary of the Regional Land Tenure Research Committee, was, together with his wife and son, fatally burned in the LaSalle Hotel fire in Chicago on June 5. He was born in Marlboro, Mass., September 29, 1911, and graduated from the Massachusetts College in 1932. He had also been associated with the Connecticut University and Storrs Station and had been Connecticut State director of rural rehabilitation for the Federal Emergency Relief Administration.

B. D. Leith, professor of agronomy and superintendent of the Hill Farms since 1929, has retired.

Dr. G. K. Underbjerg has been added to the research staff in veterinary science, and Dr. William H. Sewell, formerly of the Oklahoma College and Station, to that in rural sociology.

Association of Land-Grant Colleges and Universities.—Announcement is made that the 1946 annual convention will be held in Chicago, December 16 to 18, and preliminary meetings are scheduled for December 13 to 15.

EXPERIMENT STATION RECORD

VOL. 95

SEPTEMBER 1946

No. 3

RECENT WORK IN AGRICULTURAL SCIENCE¹

AGRICULTURAL AND BIOLOGICAL CHEMISTRY AND MICROTECHNIC

Studies of the composition of the wheat kernel, I-II. (U. S. D. A. coop. Ohio Expt. Sta.). (*Cereal Chem.*, 22 (1945), No. 5, pp. 351-371, illus. 3).

I. *Distribution of ash and protein in center sections*, V. H. Morris, T. L. Alexander, and E. D. Pascoe (pp. 351-361).—By a process of microdissection applied to central portions of wheat kernels cemented upon microscope slides and fractionated as drillings and cuttings by means of small, motor-drive dental drills, the authors obtained four pure endosperm fractions and two bran fractions. Of these, the ash and protein contents were determined. A hard red winter wheat (Tenmarq) and a soft red winter wheat (Trumbull) were used, each sample being a composite from several crops grown in various localities.

The lowest concentration of ash was found in the fraction defined as the "cheek endosperm" fraction of both varieties, with the "center" endosperm fractions about 0.05 percent higher. The concentration of ash in the peripheral endosperm zone was considerably greater than in the cheek or center fractions, although the magnitude of the difference was not the same for both varieties. Concentrations ranged from 0.246 to 0.400 percent in endosperm fractions of the Tenmarq samples and from 0.206 to 0.564 percent in Trumbull fractions. The ash content of the total endosperm of the center section was 0.359 and 0.417 percent for Tenmarq and Trumbull, respectively. In the bran fractions, Tenmarq was 0.86 percentage points higher than Trumbull, 6.42 compared to 5.56 percent.

The distribution of protein in the various fractions was much the same as that of ash except that the lowest concentration was found in the center endosperm, with the cheek fraction somewhat higher. The increase from the endosperm to the bran was much less. The protein content of the peripheral endosperm zone was 13.6 and 10.9 percent for Tenmarq and Trumbull, respectively, as compared with 8.9 and 6.8 percent in the center zone.

¹The publications abstracted in these columns are seldom available for distribution by the Office of Experiment Stations. In general, application should be made to the Office of Information of the U. S. Department of Agriculture, Washington 25, D. C., for publications of the Department; to the directors of the State agricultural experiment stations, as listed on page 3 of the cover of this issue, for publications of the several experiment stations; and to publishers of books and journals for material issued by them. Microfilms and photostatic copies, the latter without magnifying equipment, may be purchased from the Library, U. S. Department of Agriculture, Washington 25, D. C. Rates and other details will be supplied by the Library on request.

The rate of increase in concentration of ash and protein in the peripheral zone as compared to the central zone was about the same for both constituents. The principal difference in distribution was in the bran coat. In these tissues the protein content was about 1.4 times that of the whole endosperm, in contrast to the ash content which was 13 to 18 times that of the endosperm.

The relatively wide difference in concentration of ash and protein in the two zones into which the endosperm was separated is considered to offer considerable support to the idea of an increasing gradient in the concentration of these constituents from the center of the endosperm to the bran coat.

II. *Distribution of certain inorganic elements in center sections*, V. H. Morris, E. D. Pascoe, and T. L. Alexander (pp. 361-371).—Applying a spectrographic procedure, described in manipulative detail, to the wheat kernel fractions above defined, the authors found that on an ash basis, potassium was higher in concentration in the peripheral than in the central zone; phosphorus and calcium about the same in the two zones; and sodium, manganese, and copper lower in the peripheral zone. The results of the determinations of iron and of magnesium gave no consistent indications. Comparing concentrations in the endosperm as a whole with those in the bran coat, magnesium and manganese were higher in bran ash, and phosphorus and potassium were about the same in the two tissues; sodium, calcium, iron, and copper were higher in the endosperm. On a dry-matter basis, the peripheral zone contained higher concentrations of phosphorus, potassium, calcium, and probably magnesium than did the central zone. The data for the remaining elements were inconsistent. Of the relatively large differences in total ash shown to exist between the central and peripheral-endosperm zones, phosphorus and potassium accounted for a considerable part of the higher ash in the latter zone. The composition of the bran resembled that of endosperm in that both phosphorus and potassium were major constituents. It differed, however, in that magnesium also was a major constituent, the concentration equalling about half that of potassium.

Effects of variety and environment on the analyses of germinated wheat and barley, E. KNEEN and H. L. HADS. (Nebr. Expt. Sta.). (*Cereal Chem.*, 22 (1945), No. 5, pp. 407-418).—In four barley varieties from three localities, the β -amylase activities of the ungerminated grains and the α - and β -amylase activities of the germinated samples were influenced both by variety and by environment of growth. There was an interstation relationship between barley nitrogen, barley total β -amylase, and the α - and β -amylase activities of the germinated samples.

In several varieties of hard red winter wheat, also, the β -amylase activities of the ungerminated grain and the α - and β -amylase activities of the germinated samples were dependent on both variety and environment of growth. There was an interstation relationship between wheat nitrogen and wheat total β -amylase and between either of these properties and the β -amylase activities of the germinated samples. On an interstation basis, a tendency of those germinated samples having high total β -amylase also to have high α -amylase activity was evident. No relationship between the α -amylase activities of the ungerminated wheats and any other property, either of the ungerminated or the germinated samples, was apparent.

"With hard red winter wheats, as with barley, a prominent factor in the selection of samples for the development of α - and β -amylase by malting should be the environment of growth. The indication is that wheats from locations conducive to the production of high-nitrogen grain would be superior in this respect. Among those grown at any one location, a further selection may be made on the basis of variety."

Effect of moisture content, temperature, and length of storage on the development of "sick" wheat in sealed containers, E. P. CARTER and G. Y. YOUNG. (U. S. D. A.). (*Cereal Chem.*, 22 (1945), No. 5, pp. 418-428).—Sick wheat was produced artificially by storing sound wheat containing different amounts of moisture in sealed quart jars at various temperatures in temperature-controlled cabinets, the proportion of sick kernels in general increasing with the moisture content of the grain, the temperature of storage, and the length of the storage period. There was no visible fungus growth on the wheat such as usually takes place when moist wheat is exposed in the open air, except in a few jars, and these were discarded. Wheat containing 12.2 percent moisture stored at 40° C. developed sick wheat symptoms when stored 279 days or longer, but not when stored at a lower temperature. A small percentage of sick wheat was produced in 32 days in wheat containing 18.6 percent moisture when stored at 5°, and up to 100 percent sick kernels when stored at higher temperatures and for longer periods of time. The development of the sick wheat condition in general was accompanied by loss in viability and increase in fat acidity.

Preliminary studies with the extensograph, P. P. MERRITT and C. H. BAILEY. (Minn. Expt. Sta.). (*Cereal Chem.*, 22 (1945), No. 5, pp. 372-391, illus. 1).—Replicability of extensograph tests was good when a standard procedure involving the use of unleavened doughs was employed. Tests repeated on the same dough rather than single tests after varying rest periods are recommended. Oxidizing action of potassium bromate and potassium iodate effected a decrease in extensibility and in the area enclosed by the curve, and an increase in resistance to extension. Two and three successive testings of doughs treated with potassium bromate effected greater reduction in area of curves than did the corresponding tests of doughs containing potassium iodate. A positive loaf volume response to potassium bromate was obtained with a strong and medium-strength flour but not with a weak flour. Reducing agents such as sodium sulfite and sodium thiosulfate increased in extensibility and decreased in resistance to extension of doughs. Curve area was increased slightly by moderate dosages of sodium sulfite and decreased by sodium thiosulfate. Reducing action of sodium sulfite had little effect on the loaf volumes of a strong and medium-strength flour but increased the loaf volumes of a weak flour. The effects of potassium bromate and sodium sulfite added together showed a variable degree of mutual compensation. Leavening action of yeast decreased all dimensions of extensogram curves but was partially counteracted by the addition of either potassium bromate or sodium sulfite to the formula. The effects of shortenings varied with the flour. In general, they increased extensibility but had no uniform effect on resistance or curve area. Nonfat milk solids decreased extensibility and resistance to extension with flours of low protein content. A dosage of 3 gm. of nonfat milk solids per 100 gm. of flour increased curve area and stabilized doughs against the effect of repeated tests to a greater extent than a dosage of 6 gm. per 100 gm. of flour. Prolonged mixing decreased the extensibility and curve areas of fermented doughs at baking time and tended to decrease resistance and curve areas to extension. Lengthened fermentation decreased resistance and curve areas when measured at the end of the proof period.

"Age-index" values of doughs may be computed from a formula involving the protein content of the flour and measurements characterizing the extensogram. These values may prove useful in predicting the bromate requirements of doughs.

Chemical studies of pineapple (*Ananas sativus* Lindl), I-II (*Jour. Amer. Chem. Soc.*, 67 (1945), No. 10, pp. 1646-1652).—The first two papers of this series are concerned, respectively, with the general composition of the volatile oil obtainable from fresh pineapples, including a comparison of the oils from the summer and from the winter crops, and with the identification, as the methyl ester of β -methylthiolpropionic acid, of a sulfur compound found in very small quantity in the oil fractions of higher boiling point.

I. *The volatile flavor and odor constituents of pineapple*, A. J. Haagen-Smit, J. G. Kirchner, A. N. Prater, and C. L. Deasy (pp. 1646-1650).—The summer fruit was found to have a volatile oil content of 190 mg. per kilogram of the trimmed fruit, the winter fruit 15.6 mg. per kilogram, the difference between summer and winter fruit oils consisting largely in the presence of much more ethyl acetate and ethanol (119.6 mg. and 60.5 mg. per kilogram, respectively) in the summer than in the winter oil. In addition to ethyl alcohol and ethyl acetate, the following compounds were found in the summer fruit: Acetaldehyde, ethyl isovalerate, methyl *n*-propyl ketone, ethyl *n*-caproate, ethyl acrylate (probably), acetic acid, an ethyl ester of a C_5 unsaturated acid, some methyl ester of the same acid, and an ethyl ester of a C_5 keto acid. The winter fruit contained, besides ethyl acetate, the following: Acetaldehyde, methyl isocaproate, methyl isovalerate, methyl *N*-valerate, a methyl ester of a C_5 hydroxy acid, and methyl caprylate. Both the winter and summer fruit contained a sulfur compound in the higher boiling fractions. Except for the ethyl acetate, the esters investigated in the winter oil were methyl esters. In the summer fruit, only one methyl ester was found.

II. *Isolation and identification of a sulfur-containing ester in pineapple*, A. J. Haagen-Smit, J. G. Kirchner, C. L. Deasy, and A. N. Prater (pp. 1651-1652).—A sulfur-containing ester, $CH_3SCH_2CH_2COOCH_3$, was isolated from the higher-boiling volatile material from pineapple fruit pulp. This compound was converted by oxidation to the sulfone, m. p. 93.6°-94° [C.], which was identified by synthesis.

The chemical composition of the adult human body and its bearing on the biochemistry of growth, H. H. MITCHELL, T. S. HAMILTON, F. R. STEGGERDA, and H. W. BEAN. (Univ. Ill.). (*Jour. Biol. Chem.*, 158 (1945), No. 3, pp. 625-637).—Assays were made on the body of a normal adult male 35 yr. of age weighing 70.55 kg. The chemical composition was found to be as follows:

Water, 67.85; fat (ether extract) 12.51; crude protein ($N \times 6.25$) 14.39; ash, 4.84; calcium, 1.596; phosphorus, 0.771; and gross energy (heat of combustion) 1.930. Individual analyses of the skeleton, musculature, skin, and many visceral organs are reported. On the assumption that the integration of calcium accretions during the growing period equals the calcium content of the adult organism, the data from these analyses have been considered in a discussion of calcium requirements for growth. A bibliography of 39 references is included.

Studies on protein denaturation.—I, Electrophoretic study kinetics at neutrality of heat denaturation of β -lactoglobulin, D. R. BRIGGS and R. HULL. (Minn. Expt. Sta.). (*Jour. Amer. Chem. Soc.*, 67 (1945), No. 11, pp. 2007-2014, illus. 4).—At a pH value near seven and in a buffer solution having an ionic strength of the order of 0.1, the heat denaturation of β -lactoglobulin was found to involve at least two processes. The products of these could be distinguished and their ratios could be measured because of the difference between their electrophoretic mobilities.

The first process (or group of processes) which was initiated only at temperatures above 65° [C.], was not accompanied by any appreciable

change in electrophoretic mobility of the protein, but was accompanied by an approximately four-fold increase in particle weight and an increase in frictional ratio. Preliminary calculations indicated the over-all activation energy for this process to be of the order of 48,000 calories, on the assumption of a first order reaction, for the temperature change from 70° to 75°.

The second process, which could take place only after the first had occurred, proceeded at temperatures below that at which the first was initiated. The second process was accompanied by a marked increase in electrophoretic mobility over that of the native protein or that of the product of the first process. It was also accompanied by a further increase (probably unlimited) in particle weight but no marked further increase in frictional ratio. This second process, at temperatures of 70° and below and in phosphate buffer of pH 6.9, ionic strength 0.1, proceeds with a constant activation energy of about 28,000 calories and a temperature coefficient between 60° and 70° of about 3.6 ($Q_{10} = 3.6$). It followed accurately the concentration-time characteristics of a second order reaction. Above a temperature of 75° this process was markedly repressed as the temperature was increased, until at 99° it did not take place at all. Increase in pH or decrease in ionic strength of the solution, in which the heat denaturation was carried out, depressed the rate of this reaction. It is believed probable that this process was markedly influenced by the electrokinetic potential of the particles of the primary denatured protein. There was no evidence that the first denaturation process was affected in this way.

The configuration of the pyranose rings in polysaccharides, K. J. PALMER and M. B. HARTZOG. (U. S. D. A.). (*Jour. Amer. Chem. Soc.*, 67 (1945), No. 10, pp. 1865-1866).—In an X-ray study of pectin, its derivatives, and other compounds containing the uronic acid unit, the authors found an identity period of 15.0 a.u. in oriented fibres of sodium alginate. In pectic acid fibers, the identity period was close to 13.0 Å. Conclusions drawn from these observations with regard to the type of pyranose ring present, projection per unit along the fiber axis, and chain symmetry, all with reference to fiber identity period, are tabulated. It is further concluded that "(1) the galacturonide chain would appear less flexible than the others, since in both pectic acid and sodium pectate the screw symmetry remains three-fold; and (2) alginic acid and sodium alginate not only have chains of different screw symmetry but the pyranose rings apparently have different configurations."

Allyl ethers of carbohydrates.—III, Ethers of glucose and galactose, E. A. TALLEY, M. D. VALE, and E. YANOVSKY. (U.S.D.A.). (*Jour. Amer. Chem. Soc.*, 67 (1945), No. 11, pp. 2037-2039).—The preceding papers of this series (E. S. R., 94, pp. 568, 713) have been concerned with the preparation of allyl ethers of a variety of polyhydroxy compounds, including nonreducing carbohydrates but no reducing sugars. Because of side reactions in strongly alkaline solutions used for etherification, the reducing sugars gave low yields of mixed products. Glucosides were, therefore, prepared and used as intermediates, the anhydrous sugars being treated for the preparation of the intermediates with anhydrous allyl alcohol in which dry hydrogen chloride had been dissolved. Etherification of α -allyl glucoside and of α -allyl galactoside was then carried out in the usual way by the action of strong sodium hydroxide solution and allyl bromide. Penta-allyl ethers were thus prepared for the first time from α -allyl glucoside and galactoside and β -allyl glucoside tetraacetate. Also a penta-allyl ether was prepared directly from glucose. The properties of these compounds are described.

The action of hydrogen peroxide on carbohydrates, J. H. PAYNE and L. FOSTER. (Univ. Hawaii). (*Jour. Amer. Chem. Soc.*, 67 (1945), No. 10, pp. 1654-1656).—A quantitative investigation of the action of hydrogen peroxide on glyceric aldehyde, erythritol, *d*-arabinose, *d*-glucose, and sucrose showed that hydrogen was a characteristic reaction product in every instance. A satisfactory reaction mechanism placed the origin of the hydrogen in formaldehyde produced in the oxidative degradation of the compounds. Glyceric aldehyde apparently underwent a dismutation reaction in the presence of low concentrations of hydrogen peroxide.

1,4-Anhydro-D,L-xylitol, J. F. CARSON and W. D. MACLAY. (U. S. D. A.). (*Jour. Amer. Chem. Soc.*, 67 (1945), No. 10, pp. 1808-1810).—Xylitol was dehydrated with benzenesulfonic acid or sulfuric acid to yield a mixture of dehydration products from which a pure anhydroxylitol was isolated in crystalline form. Anhydroxylitol was characterized by the preparation of three crystalline derivatives, the tribenzoate, tricarbanilate, and the mono-trityl diacetate. By oxidation with periodic acid and sodium metaperiodate, anhydroxylitol was shown to contain a 1,4 oxygen ring and was designated as 1,4-anhydro-D,L-xylitol.

The thermal degradation of pectin, R. C. MERRILL and M. WEEKS. (U. S. D. A.). (*Jour. Amer. Chem. Soc.*, 67 (1945), No. 12, pp. 2244-2247, illus. 1).—The large initial decrease in viscosity of pectin solutions on heating was found to be due mainly to the breaking of primary chemical valence bonds rather than to the destruction of a secondary aggregate. This was indicated by the irreversibility of degradation, the absence of a pronounced effect of urea and temperature (up to 50 percent) on the viscosity of dilute pectin solutions, the fact that the loss in relative viscosity was found to be closely associated with a decrease in the intrinsic viscosity of the pectin, and the magnitude of the value for the activation energy of the loss in viscosity with heating time ($28,000 \pm 6,000$ calories per mole).

An X-ray diffraction investigation of sodium pectate, K. J. PALMER and M. B. HARTZOG. (U. S. D. A.). (*Jour. Amer. Chem. Soc.*, 67 (1945), No. 12, pp. 2122-2127, illus. 4).—The results of an X-ray diffraction investigation of oriented sodium pectate fibers are recorded. The authors' interpretation of these results indicates that the galacturamide chain has the configuration of a three-fold screw axis and that the chains are arranged in closest packing, the structure having pseudo hexagonal symmetry. The identity period in the fiber direction was found to be 13.1 a. u. This fiber identity period is somewhat less than the value found for some cellulose derivatives in which the chain has the configuration of a three-fold screw axis. This difference in identity periods is discussed in terms of molecular models. On adsorption, sodium pectate in equilibrium with air at a relative humidity of 40 percent was found to contain 18 percent water. A considerable portion of this water was located in the crystalline portion of the material. The non-uronide material (18 percent) was shown to have no detectable influence on the X-ray pattern.

Hydroxylation of mono-unsaturated fatty materials with hydrogen peroxide, D. SWERN, G. N. BILLEN, T. W. FINDLEY, and J. T. SCANLAN. (U. S. D. A.). (*Jour. Amer. Chem. Soc.*, 67 (1945), No. 10, pp. 1786-1789).—A new and rapid general reaction for the quantitative hydroxylation of long-chain, mono-unsaturated, aliphatic compounds is described.

The oxidizing agent, performic acid, was not isolated but was prepared and utilized in situ by dissolving the unsaturated compound in formic acid and adding hydrogen peroxide. Because of the rapidity of the reaction and

the mild conditions, only 1 mole of hydrogen peroxide was required for each mole of mono-unsaturated compound. Substantially identical results were obtained when acetic acid containing catalytic quantities of sulfuric acid was substituted for formic acid in the mixture with hydrogen peroxide. The oxidizing agent in this was peracetic acid. It was concluded that either of the two hydroxylation methods described should be suitable for the industrial production of hydroxylated fatty acids and related compounds. Application of these reactions to red oil (commercial oleic acid) gave good yields of 9,10-dihydroxystearic acid, m. p. 92°-94° [C.].

The fatty acids of corn oil, F. J. BAUR, JR., and J. B. BROWN. (Ohio State Univ.). (*Jour. Amer. Chem. Soc.*, 67 (1945), No. 11, pp. 1899-1900).—The authors distilled the fatty acid esters, without previous separation of the acids into saturated and unsaturated fractions, through a fractionating column packed with glass helices and electrically heated. They calculated the composition of the several fractions from iodine number, molecular weights, and thiocyanometric equations. The C₁₈ fraction was also studied by a low-temperature crystallization procedure developed in their laboratory. The results differ from previous analyses mainly in their finding of a substantially larger content of linoleic acid and a correspondingly lower content of oleic acid. Their specimen of the oil contained 56.3 percent of linoleic acid, 30.1 percent of oleic acid, 8.1 percent of palmitic acid, 2.5 percent of stearic acid, 1.7 percent of acids having more than 18 carbon atoms, 1.2 percent of hexadecenoic acid, and 0.1 percent of myristic acid.

The organic acid content of raw cotton fiber: Isolation of l-malic acid and citric acid from cotton fiber, E. R. MCCALL and J. D. GUTHRIE. (U. S. D. A.). (*Jour. Amer. Chem. Soc.*, 67 (1945), No. 12, pp. 2220-2221).—The authors point out that a typical sample of oven-dry raw cotton fiber contains about 94 percent cellulose, 1.3 protein, 1.2 pectic substances 1.2 ash, 0.6 wax, and 0.3 sugars, leaving about 1.4 percent of the weight of the fiber undetermined. The high content of alkaline ash and other properties indicated the probable presence of "considerable quantities" of the common organic plant acids in the fiber as salts, probably, of sodium, potassium, magnesium, and calcium. The percentages of malic, citric, and oxalic acids, and of unidentified organic acids, were determined in four samples, the malic acid content indicated being about 0.5 percent, that of the unidentified acids about 0.3 percent, of citric acid about 0.7 percent, and of oxalic acid about 0.004 percent. Quantities sufficient for identification were isolated of malic and of citric acids.

The effect of unsaturated fatty acids on *Lactobacillus helveticus* and other gram-positive micro-organisms, E. KODICEK and A. N. WORDEN (*Biochem. Jour.*, 39 (1945), No. 1, pp. 78-85, illus. 6).—*L. helveticus* (*L. casei* E) was grown in Barton-Wright and Booth's medium (E. S. R., 91, p. 250) and in a similar medium made fat-free by chloroform extraction. A total of 53 compounds were added to test their effects on the acid production of the organism. Among the compounds studied were fatty acids, sterols, vitamins, synthetic estrogens, and certain substances which alter surface tension.

Inhibition of growth and acid production of *L. helveticus* occurred with oleic, linoleic, and linolenic acids, while the methyl esters of these compounds were inactive. The degree of inhibition obtained depended upon the concentration of bacteria, the length of incubation, the amount and nature of the fatty acid added, and the presence of other liquids in the medium. The inhibition was reversed by lecithin, cholesterol, calciferol, lumisterol, α -tocopherol, α -tocopherol acetate, and calcium chloride. The inhibitory action of stilboestrol, hexoestrol, and dienoestrol could not be reversed by the addition of lecithin or cholesterol.

Linoleic acid inhibited the growth of several gram-positive bacteria, but was inactive in the case of *Proteus vulgaris* and *Escherichia coli*.

The possible mechanism of this inhibitory action is discussed, and attention is drawn to the surface activity of the compounds able to reverse the inhibition. "For the microbiological assay of riboflavin it is recommended that a standard inoculum be employed, that incubation be of 72 hr. duration, and that the material under test be extracted with chloroform."

Chemical nature of the insecticidal principle in mamey seed, M. A. JONES and H. K. PLANK. (P. R. Fed. Expt. Sta.). (*Jour. Amer. Chem. Soc.*, 67 (1945), No. 12, pp. 2226-2267).—Among plants producing insecticidal compounds and already established in the Western Hemisphere, the species *Mammea americana*, the mamey tree, has been found to contain substances highly toxic to insects in some of its parts, of which the kernel of the mature seed was found the most effective. The color tests for rotenone were found to be negative. The ground, dried seed had a marked paralytic effect suggestive of the presence of pyrethrins or of similar compounds, and material extracted by petroleum spirit could be purified as are pyrethrin extractives. In a pyrethrin determination however, a color change characteristic of the pyrethrins did not occur and biological tests "indicated that the toxicity could not be due to actual pyrethrin content," though it may be caused by a somewhat similar type of substance. It was demonstrated definitely that the toxicity is that of a compound or compounds containing no nitrogen.

Dehydrochlorination of 1-trichloro-2-*o*-chlorophenyl-2-*p*-chlorophenylethane (*o,p'*-DDT isomer), S. J. CRISTOL and H. L. HALLER. (U. S. D. A.). (*Jour. Amer. Chem. Soc.*, 67 (1945), No. 12, pp. 2222-2223).—1-Trichloro-2-*o*-chlorophenyl-2-*p*-chlorophenylethane (*o,p'*-DDT) was shown to react with refluxing ethanolic alkali to give 1,1-dichloro-2-*o*-chlorophenyl-2-*p*-chlorophenylethylene and *o,p'*-dichlorodiphenylacetic acid. Reaction with barium hydroxide in ethylene glycol at 175° [C.] gave larger proportions of the acid. *o,p'*-Dichlorodiphenylacetic acid was synthesized by the acid-catalyzed condensation of *o*-chloromandelic acid and chlorobenzene. The methyl ester and the decarboxylation product *o,p'* dichlorodiphenylmethane were prepared.

The synthesis of some organic compounds of gold, C. W. DENKO and A. K. ANDERSON. (Pa. State Col. et al.). (*Jour. Amer. Chem. Soc.*, 67 (1945), No. 12, p. 2241).—Of gold alkylxanthates of the form R-O-C≡S-S-Au, the authors prepared the esters in which R = methyl, ethyl, *n*-propyl, *i*-propyl, *n*-butyl, and *i*-butyl by treating the corresponding alcohol with carbon disulfide and potassium hydroxide to form the potassium R xanthate and slowly adding a gold trichloride solution to excess of the xanthate solution. By a similar treatment of α -thiobutyric and α -thioglycolic acids, univalent gold was made to replace the hydrogen of the hydrosulfuryl group. Of these gold compounds, prepared for physiological experiments, the xanthate derivatives were water soluble, pale yellow, and heat labile. Of the thio-acid derivatives, the sodium potassium and ammonium salts were water soluble, the calcium salts insoluble. The strontium salt of the thioglycolic acid derivative was also insoluble in water.

The continuous thermal isomerization of α -pinene in the liquid phase, T. R. SAVICH and L. A. GOLDBLATT. (U. S. D. A.). (*Jour. Amer. Chem. Soc.*, 67 (1945), No. 11, pp. 2027-2031, illus. 4).—The isomerization of α -pinene in a continuous liquid phase process was investigated over the temperature range 200°-500° [C.]. The data indicated that the reactions took place throughout this temperature range in the same manner as had been observed by other investigators in batch experiments over the temperature range

189.5°-285°. The yield of pidentene decreased and the yield of allo-ocimene increased with increasing temperature. The cyclization of allo-ocimene to α - and β -pyronene occurred throughout the range investigated. If the contact time was limited to that required for substantially complete conversion of α -pinene, the polymerization reaction became relatively unimportant at reaction temperatures somewhat above 300°. At incomplete conversions of α -pinene, the α -pinene was partially racemized. At a given temperature the same products were obtained in roughly the same yields for both vapor phase and liquid phase reaction.

The preparation of β -carotene of a high degree of purity, J. DEVINE, R. F. HUNTER, and N. E. WILLIAMS (*Biochem. Jour.*, 39 (1945), No. 1, pp. 5-6, illus. 1).—A brief description is given of the various treatments used to obtain 28 gm. of purified β -carotene starting with 1 kg. of carotene concentrate obtained from alfalfa meal. The crude concentrate in cotton seed oil had an $E_{1\%}^{1\text{cm}}$ value of 127 at 460 m μ . in chloroform. A final 2 gm. sample further purified by 5 recrystallizations gave spectroscopic values in cyclohexane, chloroform, hexane, and benzene appreciably higher, according to the authors, than those recorded in recent literature.

Autoclaving and waxing help preserve carotene of hay (*Wisconsin Sta. Bul.* 468 (1945), pp. 43-44).—Loss of carotene from alfalfa and cereal grass was largely prevented by autoclaving the material, pressing it into blocks, and sealing these with a flexible wax. The process is regarded as too expensive to come into general use on the average farm, but may be found economically adaptable to the production of vitamin supplements for livestock feeding.

Ascorbic acid and some related compounds as oxidizing agents in doughs, R. M. SANDSTEDT and B. D. HITES. (*Nebr. Expt. Sta.*). (*Cereal Chem.*, 22 (1945), No. 3, pp. 161-187, illus. 16).—The ascorbic acid analogs *d*-gluco- and *d*-arabo-ascorbic acids were ineffective as oxidizing agents in doughs. The oxidized analogs were somewhat more effective but not as effective as dehydro-*l*-ascorbic acid. Reductone, reduced or oxidized, had no oxidizing action. It was concluded that the presence of an enediol group next to a carbonyl group in a compound is no assurance that the compound will act as a chemical flour improver. Oxidation of ascorbic acid in flour extracts was effected by a heat-labile enzyme similar to that reported in other plant extracts but a heat-stable catalyst which was quite effective in the oxidation was found also to be present. The heat-stable factor was not inactivated by glutathione. The activity of both the heat-labile and heat-stable factors varied with the flour grade. Oxidation in boiled extracts was affected by light intensity, indicating that, in the presence of light, riboflavin may be a third factor promoting oxidation of ascorbic acid in flour extracts. The dehydro-ascorbic acid reductase system appeared to oxidize hydrosulfyl groups of the flour extract. There was found to be a considerable quantity of reducing material in flour extract which was oxidized by iodine but not by dehydro-ascorbic acid. In the concentrations and at the pH values used in this investigation, preformed dehydroascorbic acid was unable to oxidize glutathione except in the presence of dehydroascorbic acid reductase. Oxidation of glutathione did take place in boiled extracts in the presence of active ascorbic acid oxidation. The ascorbic acid oxidase of flour had little action on the analogs of ascorbic acid. The heat-stable catalyst effected the oxidation of the analogs and *l*-ascorbic acid at essentially the same rate, however. The dehydroascorbic acid reductase-hydrosulfyl system was unable effectively to reduce the oxidized analogs. The comparative oxidizing actions of ascorbic acid and

its analogs may be explained by their relative ability or inability to take part in the enzymatically induced oxidation of certain reducing groups which are present in flour.

Apparatus for the rapid determination of chlorophyll and carotene, R. B. GRIFFITH and R. N. JEFFREY. (Ky. Expt. Sta.), (*Indus. and Engin. Chem., Analyt. Ed.*, 17 (1945), No. 7, pp. 448-451, illus. 2).—By the use of an apparatus here described the authors found it possible to determine total chlorophyll, percentage chlorophyll a, and β -carotene, and to estimate xanthophyll concentration within an hour from the time a leaf sample was removed from the plant. The standard deviation of the total chlorophyll and carotene results obtained by this method was less than 2 percent of the means and that of the percentage chlorophyll less than 0.3 percent of its mean. Total xanthophyll determinations were less accurate than those previously reported. The apparatus is said to eliminate possible loss from the many transfers in the older procedure, to decrease the amount of apparatus required, to increase the speed of determinations, to be easily constructed, and to be self-cleaning.

Apparatus for rapid removal of solvents, W. F. BARTHEL and H. L. HALLER. (U. S. D. A.). (*Indus. and Engin. Chem., Analyt. Ed.*, 17 (1945), No. 8, p. 529, illus. 1).—Evaporation takes place in vertically placed, steam-jacketed bulb tubes, the upper, designated the boiler, being separated from the lower section, called the stripper, by a constriction and ball valve. A collecting flask for the solute is attached to the lower end of the stripper. The solution to be evaporated is admitted through a stopcock from a reservoir bulb at the top of the tube called the boiler. A condenser system and receiver for the solvent and a water boiler with immersed resistance wire heating unit and a steam condenser to return the boiler water to its boiler complete the assembly. A detailed description and scale drawing show the construction and manner of operation of the setup. It was run under reduced pressure for solvents having boiling points over from 70° to 80° C., and was found capable of removing nitromethane from pyrethrin solutions of a concentration of 10 percent or less at the rate of 1.5 l. per hour.

Glass-surfaced magnetic pump for circulating liquids in a high-vacuum system, G. D. OLIVER, W. G. BICKFORD, S. S. TODD, and P. F. FLYNN. (U. S. D. A.). (*Indus. and Engin. Chem., Analyt. Ed.*, 17 (1945), No. 3, pp. 158-159, illus. 3).—The authors describe a single-action pump of which the plunger consists of a glass tube containing a sealed-in mild steel armature held in place by asbestos plugs at either end, and so ground into its glass barrel as to permit it to be moved freely and smoothly by electromagnetic solenoids fitting closely about the outer surface of the barrel. The detail of the construction of the pump proper is shown in a drawing. The entire assembly, including a four-tube power rectifier providing current for the solenoids, an eddy-current flasher motor automatically controlling the pumping rate, hand switches for non-automatic operation, etc., is shown in a photographic illustration. The circuit diagram of the bridge rectifier used is also reproduced with the article.

Ozonizer capable of producing a constant amount of ozone, F. L. GREENWOOD. (Minn. Expt. Sta.). (*Indus. and Engin. Chem., Analyt. Ed.*, 17 (1945), No. 7, pp. 446-447, illus. 1).—It was found that by maintaining a constant transformer primary voltage and a constant oxygen flow, and by cooling the water in the Berthelot tubes, the conventional laboratory ozonizer can be designed to maintain ozone production constant to 0.1 percent ozone (by volume) over a period of 12 hr. or longer. The primary voltage of the transformer was held constant at 114 volts by means of a commercially

available voltage equalizer, the secondary voltage being 10.30 kv.; the water in the cooling tubes was controlled by passing through them a cold water stream regulated by a constant hydrostatic head device; and a constant rate of gas flow was achieved by inserting in the gas line between the oxygen tank and the ozonizer a T-tube, to which was attached a glass tube which dipped into a tube (60 cm. long) of sulfuric acid; the depth to which the glass tube penetrated the sulfuric acid was capable of rapid change by means of a rack and pinion. After about 3 to 4 hr. of operation, an oxygen flow of from 10.3 to 10.6 l. per hour was ozonized to the extent of from 5.6 to 5.7 percent. A fully dimensioned drawing of the form of Berthelot tube used accompanies the paper.

Apparatus for determination of rate of oxygen absorption with special reference to fats, M. H. MENAKER, M. L. SHANER, and H. O. TRIEBOLD. (Pa. State Col.). (*Indus. and Engin. Chem., Analyt. Ed.*, 17 (1945), No. 8, pp. 518-519, illus. 5).—The apparatus described makes a continuous and automatic record of the oxygen absorbed by the sample, at the same time maintaining constant pressure in the reaction chamber, irrespective of atmospheric pressure variations.

The constant-temperature oven was made from a baking oven by adding a fan to provide air circulation and a mercury-over-toluene thermostat. Pressure control was obtained by means of a regulator of the mercury manometer type with electrical contact in the arm communicating with the absorption vessel to open, by action of a relay circuit, a solenoid-operated valve in the connection between the absorption vessel and the oxygen reservoir when the pressure in the absorption vessel fell. In the flask serving as an oxygen reservoir, a float resting upon a mercury column supported by the pressure of the oxygen was connected to the pen of a revolving record drum. Scale drawings show the relation of parts in the complete assembly and construction of the pressure regulator and of the pressure control valve system. The electrical circuits required are shown in a wiring diagram.

A simple automatic media dispenser, A. A. ANDERSON. (U. S. D. A.) (*Indus. and Engin. Chem., Analyt. Ed.*, 17 (1945), No. 7, pp. 463-464, illus. 3).—The device described consists essentially of a 20-cc. syringe with its tip cut off, valves made by cutting a thin slice nearly off the smaller end of a rubber stopper and boring the main portion of the stopper longitudinally, suitable tubing connections to the supply vessel and the delivery tube, and a 5-in. wooden drive wheel provided with a sliding eccentric connection to the shaft operating the syringe plunger, adjustment along the slide of the degree of eccentricity of the drive shaft linkage being the means for setting the apparatus for the desired delivery volume. A 1/30 h. p. motor with 20 : 1 reduction gear and further large pulley ratio reduction in the belt drive to the wooden drive wheel permits operation at from 25 to 40 strokes per minute.

Determination of sodium and potassium in silicates: An improved method, G. G. MARVIN and L. B. WOODLAWER (*Indus. and Engin. Chem., Analyt. Ed.*, 17 (1945); No. 9, pp. 554-556).—The use of hydrofluoric and perchloric acids as a decomposition mixture was investigated. It was shown that, by the use of this mixture, the major difficulties of both the Berzelius and the J. Lawrence Smith methods of decomposition could be avoided and most of their advantages retained. A procedure whereby the solution obtained from the acid decomposition could be purified preparatory to an alkali analysis was devised. Data on synthetic and National Bureau of Standards samples were obtained.

Colorimetric determination of potassium, M. F. ADAMS and J. L. ST. JOHN. (Wash. Expt. Sta.). (*Indus. and Engin. Chem., Analyt. Ed.*, 17 (1945), No. 7, pp. 435-436, illus. 3).—The photometric determination of potassium as chloroplatinate was found reliable and convenient. A precision of 2 percent could be attained with samples containing 0.2 mg. of potassium or more. The iodoplatinate method was found about 100 times more sensitive, but slow changes of color were observed. It was concluded that appreciable errors can be eliminated only by careful calibration under well-defined conditions.

Titration of boric acid in the presence of mannitol, M. HOLLANDER and W. RIEMAN, III. (Rutgers Univ.). (*Indus. and Engin. Chem., Analyt. Ed.*, 17 (1945), No. 2 pp. 602-603).—The authors call attention to the rather wide variations in recommended mannitol concentrations for boric acid titration, and report upon a study of effects of concentration of boric acid and of mannitol upon the pH value of the acid solution and of the solution at the equivalence point, upon the slope of the titration curve at the equivalence point, and upon the titration error. They found that a sharp end point with phenolphthalein as indicator required the titration curve to have a slope of at least 3.0 pH units per cubic centimeter at the equivalence point; and that if the mannitol is present in large excess with reference to the boric acid, a concentration of about 0.35 mole of mannitol per liter of solution at the equivalence point will yield both a small titration error and a sharp end point.

Determination of fluoride in water: A modified zirconium-alizarin method, W. L. LAMAR (*Indus. and Engin. Chem., Analyt. Ed.*, 17 (1945), No. 3, pp. 148-149).—A convenient, rapid colorimetric procedure using the zirconium-alizarin indicator acidified with sulfuric acid for the determination of fluoride in water is described. This acid indicator was found to be stable indefinitely, and to be more useful than other zirconium-alizarin reagents previously reported. The use of sulfuric acid alone in acidifying the zirconium-alizarin reagent made possible the maximum suppression of the interference of sulfate. Control of the pH of the samples eliminated errors due to the alkalinity of the samples. The fluoride content of waters containing less than 500 p. p. m. of sulfate and less than 1,000 p. p. m. of chloride could be determined within a limit of 0.1 p. p. m. when a 100-cc. sample was used.

Quantitative determination of bases by means of calomel: Application to lime in commercial calcium arsenate, L. M. MARKWOOD, H. D. MANN, and R. H. CARTER. (U. S. D. A.). (*Indus. and Engin. Chem., Analyt. Ed.*, 17 (1945), No. 9, pp. 570-571).—It was shown that the reaction between bases (except ammonium hydroxide) and excess calomel, evidenced by immediate blackening, proceeds quantitatively with the formation of soluble chloride in amount stoichiometrically equivalent to the quantity of base present. After removal of dissolved mercury by means of zinc, the soluble chloride could be determined by argentometric titration. Results obtained by this method in the determination of free lime in calcium arsenate agreed well with those by an acidimetric method. The calomel method was found to have the following advantages over the acidimetric method: The end point is sharp even in the presence of magnesium hydroxide, and the method is applicable in the presence of dyes. By employing a base in excess, calomel may be determined.

Optical and X-ray diffraction studies of certain calcium phosphates, W. F. BALE, J. F. BONNER, H. C. HODGE, H. ALDER, A. R. WREATH, and R. BELL (*Indus. and Engin. Chem., Analyt. Ed.*, 17 (1945), No. 8, pp. 491-495, illus. 1).—The X-ray diffraction data, the melting points, the crystallographic systems, and the indices of refraction of 11 calcium phosphates are reported.

These are divided into four groups: A primary calcium phosphate and three derivatives, a secondary calcium phosphate and three derivatives, two tertiary calcium phosphates, and hydroxylapatite.

Determination of nitrogen, phosphorus, and potassium in leaf tissue: Application of micromethods, R. H. COTTON. (Pa. State Col.). (*Indus. and Engin. Chem., Analyt. Ed.*, 17 (1945), No. 11, pp. 734-738, illus. 1).—The Fiske and Subbarow colorimetric procedure for blood phosphorus was adapted to leaf analysis. Several methods of determining phosphorus are compared, and fundamental data are presented on colorimetric phosphorus determinations in which molybdic acid was used. The dipicrylamine micromethod for determining potassium in leaf tissue is more time-consuming than the turbidimetric cobaltinitrite procedure, but gave relatively high precision.

Determination of tryptophane, phenylalanine, and methionine: A rapid procedure, W. C. HESS and M. X. SULLIVAN (*Indus. and Engin. Chem., Analyt. Ed.*, 17 (1945), No. 11, p. 717).—In an investigation of the effects of hydrolysis methods, it was found that the results for tryptophane are substantially the same whether the alkaline hydrolyzate or intact protein is analyzed. The phenylalanine contents of squash-seed globulin and casein are likewise the same as those previously obtained by the same method. The methionine content of casein is the same as that determined following hydrolysis with 20 per cent hydrochloric acid, while the value for squash-seed globulin is but slightly higher.

Determination of nitrogen in pyridine ring-type compounds by the Kjeldahl method, R. L. SHIRLEY and W. W. BECKER (*Indus. and Engin. Chem., Analyt. Ed.*, 17 (1945), No. 7, pp. 437-438).—Mercury alone or mercury plus selenium oxychloride was found a satisfactory catalyst for the Kjeldahl determination of the nitrogen content of compounds containing a refractory ring-type nitrogen, as in pyridine nicotine, nicotinic acid, or quinoline. A digestion-time study showed that 3 to 4 hr. are required for complete digestion of these compounds by the mercury catalysts.

Copper sulfate and selenium oxychloride yielded extremely low results, even on prolonged digestion.

Isolation of constituents of cane juice and blackstrap molasses by chromatographic methods, W. W. BINKLEY, M. G. BLAIR, and M. L. WOLFROM. (Ohio State Univ.). (*Jour. Amer. Chem. Soc.*, 67 (1945), No. 10, pp. 1789-1793). Inositol (m. p. 225° [C.]) was isolated from sugarcane juice (as inositol hexaacetate) and from cane blackstrap molasses. The presence of phytin in cane molasses was detected by biochemical methods. D-Mannitol was isolated in small amount from a normal sample of cane molasses but was found to be absent in normal cane juice. D-Glucose (as β -D-glucose pentaacetate) was isolated from cane molasses. It was demonstrated that a commercial sample of baker's yeast was able to dephosphorylate phytin.

The use of ion exchange resins in a method of deacetylation is described.

Rapid determination of starch: Factors for starches and comparison with acid and enzymic hydrolysis methods, J. P. NIELSEN and P. C. GLEASON. (U. S. D. A.). (*Indus. and Engin. Chem., Analyt. Ed.*, 17 (1945), No. 3, pp. 131-134, illus. 1).—This paper presents factors for calculation, from measurements of the color developed in the iodine reaction, of the percentage of starch in various vegetables with potato starch as standard; compares results by the proposed method with those by an enzyme procedure; describes minor revisions that increase the accuracy of the original method; and describes its application to dehydrated foods. Data to show that the enzyme procedure used for comparison is not applicable to all types of starches are

given. Acid hydrolysis was used to establish calculation factors for certain pure starches. Several thousand samples analyzed for starch content by the proposed procedure included fresh, frozen, dehydrated, and canned vegetables and apples.

[Quantitative estimation of hemicelluloses] (*Massachusetts Sta. Bul. 438* (1945), p. 24).—Preliminary experiments indicated that sodium chlorite could be made an effective reagent for the separation of the holocellulosic component of non-woody plant tissue in a form suitable for the quantitative estimation of the hemicelluloses. The process is said to be long, but was found to be simple, to demand but little attention, and to eliminate other operations more tedious and lengthy. It was possible to prepare in this way a product which contained the hemicelluloses and was substantially free from lignin.

Determination of the methyl ester content of pectin, C. H. HILLS, C. L. OGG, and R. SPISER. (U. S. D. A.). (*Indus. and Engin. Chem., Analyt. Ed.*, 17 (1945), No. 8, pp. 507-510, illus. 2).—Sources of error in the Zeisel and saponification methods for determining the methyl ester content of pectin were discovered, and improved procedures are presented. A third method, utilizing the specific action of pectase for hydrolyzing pectin methyl ester, is recommended for general use as more rapid than the Zeisel method and involving fewer sources of error than the saponification method.

Quantitative determination of *d*-xylose by selective fermentation, L. E. WISE and J. W. APPLING (*Indus. and Engin. Chem., Analyt. Ed.*, 17 (1945), No. 8, pp. 182-184).—A simple microbiological method which permits the determination of 12 to 50 mg. of xylose in the presence of glucose, mannose, arabinose, and glucuronic acid, with an accuracy of 96 to 104 percent is described. It depends on the use of *Hansenula suaveolens* (N. R. R. L. No. 838), which ferments xylose quantitatively but not arabinose, rhamnose, fucose, and glucuronic acid. Inasmuch as N. R. R. L. No. 838 also ferments glucose, the hexoses must be fermented prior to its use. Such fermentation is affected by *Saccharomyces carlsbergensis* (N. R. R. L. No. 379), which has only a very slight action on xylose (an error for which correction may be made).

Spectrophotometric determination of alpha-eleostearic acid in freshly extracted tung oil: Determination of extinction of coefficients in oil solvents, R. T. O'CONNOR, D. C. HEINZELMAN, A. F. FREEMAN, and F. C. PACK. (U. S. D. A.). (*Indus. and Engin. Chem., Analyt. Ed.*, 17 (1945), No. 8, pp. 467-470, illus. 2).—The authors report upon a study made of the procedure for estimating α -eleostearic acid in freshly extracted tung oil by direct spectrophotometric measurements. Extinction coefficients for the pure acid in oil solvents are reported. A possible explanation of the discrepancies in the value of this coefficient in ethyl alcohol (partial deterioration during storage) was to some degree supported by storage experiments. The extinction coefficients in hydrocarbon solvents were used to determine the α -eleostearic acid content of some tung oil samples. The spectrophotometric procedure used was found to be more direct, much simpler, considerably more rapid, and very probably, because of these factors, more accurate than chemical methods.

Determination of itaconic acid in fermentation liquors, M. FRIEDKIN (U. S. D. A.). (*Indus. and Engin. Chem., Analyt. Ed.*, 17 (1945), No. 10, pp. 637-638).—A method for the direct determination of itaconic acid in fermentation liquors containing other acids and glucose involved the use of aqueous bromine buffered at pH 1.2 to ensure the selective absorption of bromine by the itaconic acid. The principal advantage claimed for the bromine absorption method is that itaconic acid can be determined directly in fermentation liquor containing glucose and many acids known to be mold metabolites.

Aconitic acid, an unsaturated acid which has been suggested as a possible precursor of itaconic acid, can be determined directly in fermentation liquor containing glucose and many acids known to be mold metabolites and does not interfere. Another advantage is that bromine absorption values, when compared to total acidity values, indicate relative purities of experimental fermentations with respect to itaconic acid production. Analyses with aqueous bromine buffered at pH 3.0 resulted in apparent purities exceeding 100 percent. These high values were usually associated with fermentations that showed much pigmentation and low acid production. Though no purity index above 100 was encountered when the analysis was conducted at pH 1.2, it is pointed out that unsaturated pigments should be considered as possible interfering substances in evaluating the results of the bromine absorption method.

Ring and ball softening points of resins: A constant-temperature air-bath method, V. E. GROTLISCH and H. N. BURSTEIN. (U. S. D. A.). (*Indus. and Engin. Chem., Analyt. Ed.*, 17 (1945), No. 8, pp. 476-480, illus. 5).—The usefulness of softening points and methods used in their determination are discussed. Objections to the present methods and criteria for improved methods are pointed out. The determination of softening point is discussed from a theoretical point of view. It is shown that any method of obtaining this value, to be practical, must ignore to a great extent the principle of measuring the transition point while no change occurs in the internal temperature of the system.

An air-bath method of test for softening point operated at constant temperature is described, together with experimental data. A method for computing the correction to be applied for correlating values obtained at different bath temperatures is presented. The corrected softening point values were found to be in close agreement with usual E28-42T ring and ball values. The data presented show the application of the method over a range of softening points between approximately 70° and 170° C. The apparatus used consisted mainly of standard equipment used in making A. S. T. M. ring and ball tests. A scale drawing of a special ring holder is shown. In a recommended procedure, more rapid than the regular A. S. T. M. E-28-42T method and applicable to a wide range of softening points and resin types from rosin to high-melting synthetic resins, results could be duplicated within 1.0°.

A study of methods for determination of riboflavin (*Massachusetts Sta. Bul.* 428 (1945), p. 47).—Biological (1), microbiological (2), and fluorophotometric (3) methods used in determining riboflavin were compared in a study of the riboflavin content of beans, milk, kale, and fish. Low values were noted in baked beans assayed by method (2). Certain modifications of methods (2) and (3) were necessary before good agreement among all three methods could be reached.

Method (3) gave low results when the riboflavin standard was assayed separately. The addition of the standard riboflavin solution to the extract of the food sample was necessary in order to obtain results comparable to those obtained by the other procedures. Enzymatic digestion of the sample appeared to be unnecessary. In method (3), the use of florosil and the oxidation step with KMnO_4 were not essential. In method (2), the removal of fat or the addition of an irradiated extract to the blank and to the standard curve produced no change in the riboflavin values obtained.

No loss of riboflavin occurred when frozen baked beans, blanched kale, or steamed fish were stored over a 6-mo. period.

Agar-streak method for assaying antibiotic substances, S. A. WAKEMAN and H. CHRISTINE REILLY, (N. J. Expt. Stas.). (*Indus. and Engin. Chem., Analyt. Ed.*, 17 (1945), No. 9, pp. 556-558).—It was found that the agar-streak method for assaying antibiotic substances is rapid, does not require a sterile sample, permits testing unknown substances against several bacteria or fungi at one time, and can be used to test substances in nonaqueous solutions. Although it is less precise and less rapid than some other methods it had marked advantages, especially in screening tests with a large number of organisms and in isolation procedures of the antibiotic substances.

Spectrographic determination of some metallic elements in food and feces, J. K. BRODY and D. T. E. WING. (Mich. State Col., et al.). (*Indus. and Engin. Chem., Analyt. Ed.*, 17 (1945), No. 10, pp. 627-631, illus. 3).—A direct current arc method is described. Special attention was given to a study of the effects of the extraneous elements encountered in food and fecal samples. A specially devised buffer solution permitted sodium, potassium, magnesium, calcium, and phosphorus to vary over a considerable concentration range without influencing the ratio of certain lines of the metallic elements to an internal standard bismuth line. When this buffer solution was used, good comparisons between spectrograph and chemical results were obtained. Other advantages pertaining to the development of working curves and to corrections for background are attributed to the buffer solution.

Estimation of sucrose and lactose in binary mixtures with particular application to sweetened condensed milk, H. H. BROWNE. (U. S. D. A.). (*Indus. and Engin. Chem., Analyt. Ed.*, 17 (1945), No. 10, p. 623, illus. 1).—The method here described is based upon the fact that the addition of sodium bisulfite decreases the optical rotation of the aldose sugars in a manner such that the optical rotation of a mixture of two sugars of which one is an aldose can be made a linear function of the concentration of each sugar. The author's procedure consists essentially in the determination of the percentage of total sugars by means of the refractometer and the measurement of the optical rotation of a solution containing a known percentage of total sugars in the presence of sodium bisulfite. Actual determination of the two sugars was made from a graph of the data obtained by dissolving the sugars in the ratios given in sugar dilution flasks, adding 30 gm. of sodium metabisulfite per 10 gm. of sugar, making up to the 110-cc. mark with distilled water, letting stand (stoppered) about 2 hr. at 20° C., and then reading the rotation. It was found that when the rotations corresponding to the two 100 percent points were plotted and then connected by a straight line, the intermediate points all lay practically on this line.

Colorimetric method for determination of DDT, E. L. BAILES and M. G. PAYNE. (Colo. Expt. Sta.). (*Indus. and Engin. Chem., Analyt. Ed.*, 17 (1945), No. 7, pp. 438-440, illus. 1).—Purified DDT (0.1 gm.) was dissolved and made up to 50 cc. with benzene, and 10 cc. of this solution were heated in a constant-temperature water bath at 66° C. for 5 min. Then the solution was treated with 0.5 gm. of anhydrous aluminum chloride, and the mixture was heated for 1 hr. at 66°. The complex was decomposed with 3 cc. of water, and 30 cc. of benzene were added. This product was treated with 1.5 gm. of anhydrous calcium chloride and allowed to stand until the turbidity disappeared. The benzene layer was decanted into a 100-cc. volumetric flask. The residue was washed with small portions of benzene to remove the last traces of color, added to the volumetric flask, and diluted to volume with benzene. The percentage transmission was read in the photoelectric colorimeter: If the benzene layer was turbid, as often occurred in fruit strippings, it was

necessary to allow it to stand before reading. A temperature above 66° decreased the intensity of color; the reaction was completed in 1 hr. The color developed as soon as the complex was decomposed with water and the product dissolved in benzene. Samples of fruit could be stripped with small quantities of benzene diluted to a definite volume and an aliquot part treated according to the above procedure. The colored substance so developed had its maximum light absorption at 420 m μ . Developed in ethylene chloride in place of benzene, the color had maximum absorption at 530 m μ .

Colorimetric determination of DDT: Color test for related compounds, M. S. SCHACTER, S. B. SOLOWAY, R. A. HAYES, and H. L. HALLER. (U. S. D.A.). (*Indus. and Engin. Chem., Analyt. Ed.*, 17 (1945), No. 11, pp. 704-709, illus. 5).—A colorimetric method developed for the estimation of small quantities of DDT down to about 10 μ g. involves intensive nitration and the production of colors by the nitrated products in benzene plus methanolic sodium methylate. It was found that this color reaction can also be used as a test for degradation products of DDT and some compounds related to it.

Various possible contaminants caused more or less rapid fading of the color, especially impurities in technical benzene yielding hydrogen sulfide on distillation, and sulfur from rubber stoppers not freed from sulfur by boiling with strong sodium hydroxide solution before use. The presence of water in the benzene used to dissolve the nitrated residue, or that of water or sodium hydroxide in the sodium methylate solution, also caused rapid fading. The identity of the nitration products yielding the color was not determined.

Determination of 1-trichloro-2,2-bis(p-chlorophenyl)ethane in technical DDT, S. J. CRISTOL, R. A. HAYES, and H. L. HALLER. (U. S. D. A.). (*Indus. and Eng. Chem., Analyt. Ed.*, 17 (1945), No. 8, pp. 470-472, illus. 1).—The authors point out that technical DDT consists essentially of a mixture of 1-trichloro-2,2-bis (p-chlorophenyl)ethane (p,p'-DDT) and 1-trichloro-2-o-chlorophenyl-2-p-chlorophenylethane (o,p'-DDT), with small amounts of by-product and describe a method for the determination of 1-trichloro-2,2-bis (p-chlorophenyl)ethane, which is the most effective insecticidal component present, in technical grades of DDT as well as in dusts containing DDT. The method involves crystallization from a saturated solution of 1-trichloro-2,2-bis (p-chlorophenyl)ethane in 75 percent aqueous ethanol and is apparently reliable to within 1 percent when a small empirical correction is added.

Quantitative estimation of DDT and of DDT spray or dust deposits, F. A. GUNTHER. (Calif. Citrus Expt. Sta.). (*Indus. and Eng. Chem., Analyt. Ed.*, 17 (1945), No. 3, pp. 149-150).—A method for the quantitative estimation of the amount of DDT in a sample containing it is based upon the quantitative dehydrohalogenation of DDT under suitable manipulative conditions. A specific application to the determination of spray or dust deposits is discussed in detail. Data to show both the accuracy and the reproducibility of the method are presented, and possible sources of error are discussed.

Determination of petroleum oil spray deposits on citrus leaves, J. B. REDD. (Fla. Expt. Sta.). (*Indus. and Engin. Chem., Analyt. Ed.*, 17 (1945), No. 10, pp. 621-623).—In studying the insecticidal efficiency and phytocidal value of petroleum oil spray deposits on citrus, it was necessary to determine accurately the amount of oil deposited by oil sprays and the amount retained by the foliage over a period of several weeks. In order to eliminate the error introduced by the extraction of variable amounts of plant waxes and at the same time retain the advantages of gravimetric measurement, it is proposed to sulfonate the extract in petroleum ether, separate the petroleum ether containing the unreacted oil, and weight the residue after evaporating the ether:

Determination of sulfur dioxide in fruits, J. D. PONTING and G. JOHNSON. (U. S. D. A.). (*Indus. and Engin. Chem., Analyt. Ed.*, 17 (1945), No. 11, pp. 682-686, illus. 1).—The authors consider none of the various methods reviewed to be satisfactory for the analysis of fruits sampled in the frozen state if the samples contain, as is usual, oxygen and active oxidizing enzymes. For rendering the sulfur dioxide nonreactive toward iodine titrating solutions, they found acetone to give an end point not as good as that provided by formaldehyde. They developed a method in which the sulfur dioxide content of frozen fruits and of other types of fruit can be determined rapidly by extraction by blending in buffered sodium chloride solution (which stabilizes sulfur dioxide against enzymic and autoxidation), filtration, treatment with alkali to dissociate combined sulfur dioxide, and acidification and titration with iodine, with and without added formaldehyde, which binds sulfur dioxide.

Varietal responses to certain baking ingredients essential in evaluating the protein quality of hard winter wheats, K. F. FINNEY and M. A. BARMORE. (Kans. Expt. Sta. coop. U. S. D. A. and State expt. stas.). (*Cereal Chem.*, 22 (1945), No. 3, pp. 225-243, illus. 4).—Baking test data of flours from the crops from 1938 to 1942 indicated that a formula for testing varieties of hard winter wheats should contain adequate amounts of milk, malt, and potassium bromate; that milk solids buffer the oxidative effects of bromate and also serve to buffer the detrimental effects resulting from overdosages; that varieties differ in bromate requirement and response; and that with such formulas commercial varieties are evaluated in agreement with trade opinion. It is considered an important advantage of such rich, highly bromated formulas as that proposed by the authors that all varieties tend to produce bread having equally good crumb structure and hence scoring alike as to grain but differing in loaf volume according to the protein content and protein quality of each variety. For most varieties of hard winter wheat, loaf volumes increased rapidly at first and then more slowly with increasing proportions of potassium bromate until the optimum was reached, after which there was a decline. A variation of 1 mg. either way from the optimum when using the rich formula was found not likely to result in serious discrepancies.

The effect of mixing speed and dry milk solids on bread volume, E. C. SWANSON and E. G. BAYFIELD. (Kans. State Col.). (*Cereal Chem.*, 22 (1945), No. 3, pp. 214-224, illus. 3).—The behavior of three flours with 0, 2, 6, and 12 percent of dry milk solids, with seven mixing speeds in the Swanson-Working mixer and with four speeds in the Hobart-McDuffee mixer, was studied. A Tenmarq sample was also studied at seven mixing speeds in the Working mixer. Data were collected on optimum mixing times and on loaf volumes. At all speeds of all machines, optimum mixing time increased with increasing milk solids, but the increase was very small at high speeds. In general, at all speeds and levels of milk solids, Tenmarq required longer mixing times than Chiefkan, and the commercial flour held an intermediate position. Loaf volumes for Chiefkan were consistently reduced by added milk solids, but those for the other two flours were improved. In all three mixers Tenmarq yielded maximum loaf volumes at intermediate levels of milk solids.

Optimum vs. fixed mixing time at various potassium bromate levels in experimental bread baking, K. F. FINNEY and M. A. BARMORE. (Kans. Expt. Sta. coop. U. S. D. A. and State expt. stas.). (*Cereal Chem.*, 22 (1945), No. 3, pp. 244-254, illus. 4).—For flours from several varieties of hard red winter, and from one variety of hard red spring wheat in each of 3 yr., mixing time and potassium bromate compensated for each other to some extent but were by no means completely interchangeable. With inadequate bromate,

overmixing improved the bread, probably because the deleterious effects of overmixing are more than offset by the beneficial effects of the oxidation induced by the additional mixing. With optimum or near-optimum bromate levels either undermixing or overmixing reduced the loaf volumes and crumb scores, the decrease being proportional to the departure from the optimum mixing time. The data afforded a satisfactory explanation of the conflicting results previously reported for overmixed dough. It appeared that overmixing produced a deleterious effect, but if the dough was not sufficiently oxidized these effects could be obscured by the beneficial effects of the additional oxidation provided by the longer mixing time. Undermixing irrespective of oxidation produced lower loaf volumes and poorer bread than the flour was capable of producing. These relations appeared to be especially important in work designed to characterize and evaluate varieties of hard red winter wheat which varied a great deal with respect to mixing and bromate requirements.

Effect of fermentation, rest periods, and formula ingredients on mixogram patterns. J. A. JOHNSON and C. O. SWANSON. (Kans. Expt. Sta.). (*Cereal Chem.*, 22 (1945), No. 3, pp. 204-214, illus. 6).—The mixogram patterns obtained on no-rest doughs, continuous mixing, differed markedly from those obtained after rest or fermentation periods. The patterns of the mixograms obtained on flour-water doughs after rest periods of 3 hr. were nearly the same as those obtained from sponge doughs after 3 hr. of fermentation. The rest period and the fermentation process each markedly shortened the time to reach the mixogram peak and increased the steepness of the ascending and of the descending slopes. Thus, the rest periods produced about as great an effect on patterns as the process of yeast fermentation. When all the ingredients were present in the sponge during the fermentation period, the height and the band width were increased—sodium chloride having the greatest effect, potassium bromate and shortening having none. The effect of yeast, sugar, and malt was small but that of milk moderate. Mixogram patterns from sponge doughs of the various varieties differed less than those from no-rest doughs, but the varietal effect can be clearly observed. While the mixing times of Tenmarq and Turkey were shortened in the fermented sponge doughs, they still remained longer than for Chiefkan and Early Blackhull.

Some factors causing dark-colored maple sirup. F. W. HAYWARD and C. S. PEDERSON (*New York State Sta. Bul.* 718 (1946), pp. 14, illus. 13).—The authors note that the principal characteristic considered in the grading of maple sirup is the color, the lighter-colored sirup having usually the more delicate maple flavor. They find that the color depends upon the alkalinity of the sap and by the small and variable quantity of invert sugar which is always present, the darkening of the sirup being accompanied by a lowering of the pH value and of the reducing-sugar content. It was further found that "growth of bacteria causes increased alkalinity and inversion of sucrose, which, in turn, result in darker-colored sirup. The bacteria grow even at temperatures slightly above the freezing point and cause significant deterioration in color. Cleanliness of equipment and rapid handling of the sap, therefore, are very important factors in production of high quality, light-colored maple sirup."

The storage of maple sirup. F. W. HAYWARD (*New York State Sta. Bul.* 719 (1946), pp. 3, illus. 6).—The author finds that maple sirup may be held in storage successfully if it be carefully packed and kept under suitable conditions. To minimize darkening, the storage temperature should be as low as is practicable, a cool, dry cellar being very suitable. Storage temperatures should be low to minimize darkening. Containers should be filled hot and full in order to exclude oxygen which will discolor sirup, and in order to prevent

mold growth, which will cause off-flavors and inversion of sugar. Maple sirup may be reheated for canning without appreciable change in character.

[Chemical investigations of hemicelluloses] (*Massachusetts Sta. Bul. 428 (1945), p. 25*).—In purified hemicellulose preparations from corncobs and from rye straw, xylose appeared to be the principal sugar. A uronic acid, believed to be glucuronic acid, was also present in both samples. Glucose was present but galactose could not be detected. Acetylation indicated that the corneob hemicellulose had two hydroxyl groups (theoretical acetyl content, 39.81 percent; found, 39.73 percent). The data obtained indicated that the xylose units probably are linked through the 1,4 positions and that the preparation was quite pure. Hemicellulose from rye straw did not acetylate satisfactorily. The "repeating units" appeared to be of from 25 to 40 units in length, corresponding to an approximate molecular weight of from 3,000 to 6,000. Hydrolytic and polariscopic studies indicated that the xylose units in both hemicelluloses had a pyranose structure with a β -type linkage between units. Alkalilability numbers were about equal and were comparable to those of commercial samples of cornstarch. Complete hydrolysis of both hemicelluloses could be obtained with 4-percent sulfuric acid in approximately 4 hr., whereas the usual time is about 15 hr. This shorter time of hydrolysis decreased the destruction of uronic acids.

[Investigation of agricultural waste products—lignin] (*Massachusetts Sta. Bul. 428 (1945), p. 25*).—Pure lignin was added to finely ground samples of silage, timothy hay, cornstalks, and oat hay, thoroughly mixed, inoculated with a soil suspension and allowed to incubate at about 32° C. for several months. The lignin contained 64.2 percent of carbon and 5.6 percent of hydrogen and was added in amounts equivalent to about 14 percent of the plant material. Added nitrogen was supplied in the form of 1 gm. of ammonium carbonate to each 100 gm. of the organic material and total and ammoniacal nitrogen, solids and the pH value were determined at intervals. Tentative results indicated that there was a greater loss of organic matter from the cornstalks and oat hay in the presence of added lignin; timothy hay and silage decomposed at about the same rate with or without lignin. In general, ammonification was retarded in the presence of lignin. Added lignin did not appear to alter materially the rate of aerobic decomposition of plant substances when sufficient nitrogen was available.

AGRICULTURAL METEOROLOGY

Dynamic meteorology, J. HOLMBOE, G. E. FORSYTHE, and W. GUSTIN (*New York: John Wiley & Sons; London: Chapman & Hall, 1945, pp. 378+ , about 150 illus.*).—This volume is intended as a basic textbook in theoretical meteorology for students preparing for a professional career in meteorology; it may also be helpful in such applied sciences as geophysics, aerodynamics, hydrology, and pure physics. The aim is to provide a theoretical background for understanding the physical behavior of the atmosphere and its motions. Only material considered indispensable to the practical meteorologist and weather forecaster is included. Starting from the fundamental concepts of physics, the book develops the thermodynamical and hydrodynamical principles by which atmospheric phenomena and the evolution of the weather may be explained.

The teaching of meteorology in colleges and universities: Recommendations of the Committee on Meteorological Education of the American Meteorological Society, H. R. BYERS ET AL. (*Amer. Met. Soc. Bul., 27 (1946), No. 3, pp. 95-98*).

Regarding the evaluation of periodicity in extended meteorological series, C. BENEDICKS (*Svenska Vetensk. Akad. Arkiv Mat., Astron., och Fys.*, 32 (1945), No. 1, Sect. B, Art. 2, pp. 7, illus. 2).—The simple periodical analysis made implied that a periodicity occurring in an otherwise random material is best revealed when using averages, the basis of which approaches the half period. The general character of the curve obtained by the author using 21-yr. averages for the temperature indexes of Hellmann-Pettersson proved fairly similar to the exposition of mean temperatures given by A. Ångström. It appears advisable in long meteorological series to investigate the 45-yr. period found by the author, using consecutive averages on the basis of 22 or 23 yr.

Calibration and characteristics of a sensitive hot-wire anemometer, T. A. STEEVES, A. E. CHADDERTON, and W. H. COOK (*Canad. Jour. Res.*, 23 (1945), No. 3, Sect. F, pp. 192-197, illus. 3).—"A wet test meter was used to measure the air supplied to a small wind tunnel that could be adjusted to provide up-, down-, or side-draughts for the calibration of a sensitive hot-wire anemometer. The readings on the instrument used were independent of the direction of air flow and the orientation of the instrument at velocities in excess of 10 ft. per minute. At lower velocities separate curves were obtained for different instrument orientations and directions of air movement. Air flows as low as 1 ft. per minute can be estimated with useful accuracy provided the direction of air movement is known."

The errors of cup anemometers in fluctuating winds, F. J. SCRASE and P. A. SHEPPARD (*Jour. Sci. Instruments*, 21 (1944), No. 9, pp. 160-161, illus. 1).—"The overestimation of mean wind speed in a variable wind is investigated for Sheppard and Meteorological Office patterns of the 3-cup anemometer. Comparison of Schrenk's theory with observation shows satisfactory agreement for hemispherical cups. Conical cups overestimate mean wind speed to a much smaller extent than hemispherical cups and are to be preferred therefore when unsteady winds, e. g., natural winds, are to be measured. For a given cup form, overestimation appears to be a minimum mass per unit area of cup; other parameters such as cup diameter and arm length are of secondary importance."

Dial wind indicators, R. L. IVES (*Amer. Met. Soc. Bul.*, 27 (1946), No. 3, pp. 117-120, illus. 4).—The author describes and illustrates electric-clock relay controlled indicators of wind speed and direction designed to operate at predetermined time or interval and to retain the record of conditions at that time for a definite period.

Mesure de l'humidité relative de l'atmosphère, E. BRUN (*Fruits d'Outre Mer*, 1 (1946), No. 7, pp. 195-200, illus. 4).—The author discusses relative humidity as such, its absolute measurement and measurement by the usual methods, and new apparatus for the purpose.

Size of raindrops, V. N. KELKAR (*Indian Acad. Sci. Proc.*, 22 (1945), No. 6, Sect. A, pp. 394-399, illus. 6).—In this note the author describes the results of measurements of sizes of raindrops deduced from the areas of splashes produced by them on glazed paper coated with ink and dried before use. The method is believed competent to measure the intensity of precipitation in very short intervals, the number of drops per cubic meter of air in a shower together with their size distribution, and the distribution of drop size from different parts of a rain cloud.

Monthly Weather Review [October-December 1945] (*Mo. Weather Rev. [U. S.]*, 73 (1945), Nos. 10, pp. 167-182, illus. 10; 11, pp. 185-199, illus. 11; 12, pp. 201-229, illus. 15).—In addition to meteorological, climatological, solar radiation, and sunspot data in each number, No. 12 contains articles on

The Weather of 1945 in the United States (pp. 201-205) and Preliminary Report on Tornadoes in the United States During 1945 (pp. 207-209), both by J. L. Baldwin.

[Highlights in Ohio weather for 1944 and 1945], J. T. McCLURE (*Ohio Sta. Bimo. Bul.* 239 (1946), pp. 47-52).—Climatological data are presented in text and tabular forms.

Seasonal precipitation range in the United States, S. S. VISHNER (*Ecology*, 37 (1946), No. 1, pp. 81-87, illus. 8).—A sort of summary of the findings on seasonal precipitation contrasts is presented in a table showing the approximate amount of range in the central or core parts of each of 12 precipitation regions; this makes it somewhat more obvious that the common range averages for the entire country about 4 in. in each season and is largest in the Deep South, where it is 7 in. The extreme ranges average for the 12 regions is nearly 10 in., the South again being least fortunate with 16 to 18 in. The ratio between range and average precipitation is least—for the average of the country—in summer and, fortunately, greatest in the fall. The South Pacific coast region has an average ratio even greater than that of the Great Basin. The Upper North is most fortunate. There is a steady southward increase of the ratio in each of the longitudinal belts. Hence, in this important respect, the southern part of the country is less fortunate than the northern.

Foreshadowing this winter's (1945/6) precipitation in the northern Rocky Mountains and North Pacific States region, I. I. SCHELL (*Amer. Met. Soc. Bul.*, 27 (1946), No. 3, pp. 131-132).

Geographic variation in annual rainfall on Oahu, C. K. WENTWORTH (*Hawaii Univ., Res. Pub. No. 22* (1946), pp. 14+, illus. 4).—Variations of interstation annual rainfall ratios from the mean were determined over 35 yr. for all the pairs of stations included in 13 stations—or 78 pairs and 2,730 ratios. Extreme ratios ran as high as 3.0 indicating that a given station in relation to another may receive as much as three times—or as little as a third of—the expected amount. For the best-correlated pairs, the most probable deviation was less than 10 percent; for the least well correlated, it was near 45 percent. In the majority of station pairs, plotting on log-probability paper revealed a close adherence to the normal curve, with no systematic evidence of skewing; the few pairs deviating from this pattern are believed to be inclusive of any generic natural tendency. The closest correlation existed between stations fairly close together, so as to be influenced by unit storms of a few miles in diameter and similarly located with reference to windward or leeward slopes, high or low elevations, and other topographic conditions. Given a station not over 5 to 10 miles away and similarly situated the probable rainfall at a new or lapsed station can be estimated from a valid interstation ratio with a probable deviation of not over about 20 percent. Only the very high rainfall stations (like Luakaha) have probable deviations annually from their own mean which are smaller than this. All the others, with rainfall less than about 100 in. annually, have large enough annual variations so that reference to other stations and use of interstation ratios result in an improved estimate.

A new formula for precipitation effectiveness, J. SETZER (*Geog. Rev.*, 36 (1946), No. 2, pp. 247-263, illus. 11).—While investigating soil genesis in São Paulo, Brazil, the author mapped certain climatic elements of this and neighboring regions. The maps provided a clue to differences in the physical and chemical properties of the soils originating from similar rocks under different climates and also guided the development of certain ideas on the negative or positive effects of climatic factors on various important crops

grown on the principal soil types of the State. From the data of 110 meteorological stations, the author prepared annual and seasonal rainfall maps, maps for the rainiest and least rainy months, and similar ones dealing with mean temperatures. In compiling them, interpolations were necessary and pedologic conditions were also taken into consideration. Besides these and other climatic maps, maps of São Paulo were drawn in accordance with Köppen's international classification, Serebrenick's Brazilian classification, and Thornthwaite's classification based on temperature efficiency and precipitation effectiveness. Use of the last suggested the possibility of deducing a new formula for precipitation effectiveness, based on the well-known law of Van't Hoff. The author believes that the empirically derived geometrical progression here presented and discussed gives a more rational climatic classification. "Whatever the progression employed, it must be empirically obtained; for the influences of humidity and temperature bear on so many interacting phenomena that the possibility of simple mathematical elaboration is virtually precluded. The question is that of the influence of those climatic factors over a large and complex combination of phenomena and their interactions, so that only an empirical treatment can be satisfactory. The bases, however, can be established by a well-known general chemical law."

Effect of climate on the performance of grapes in Michigan: Some 1945 observations. R. E. LOREE (*Michigan Sta. Quart. Bul.*, 28 (1946), No. 3, pp. 173-175).—A brief summary is presented of the effects on grapes of the unfavorable climatic conditions of 1945, with an interpretation and recommendations. Size of crop, maturity at harvest, and quality of fruit of certain varieties at East Lansing are tabulated. Length of season and the amount of summer heat are considered important for grape production; these as well as other factors should be considered in selecting varieties and sites for establishment of young vineyards.

Effect of low temperatures on the vegetation of the Barrens in central Pennsylvania. W. S. CLARKE, JR. (Pa. State Col.). (*Ecology*, 27 (1946), No. 2, pp. 188-189).—Hough has shown how frost pockets have affected the vegetation in stream valleys of the northern Allegheny Plateau of Pennsylvania (E. S. R., 93, p. 719); the author briefly describes in this note a similar condition—probably even more extreme—in the region known as the Barrens in the central part of the State.

SOILS—FERTILIZERS

Our American land: The story of its abuse and its conservation, H. H. BENNETT (U. S. Dept. Agr., Misc. Pub. 596 (1946), pp. 31, about 40 illus.).—This well-illustrated publication points out the extent of the problem of erosion and the serious condition of soils that are depleted as a result. Emphasis is placed again on the treating of land according to its needs and using it according to its capabilities to accomplish soil conservation. A discussion is presented as to what the soil conservation districts are doing to accomplish soil conservation through cooperative effort and long-time planning. The procedure in preparing a farm plan for attaining soil conservation and the principal conservation practices are set forth in detail.

Experiments in the control of soil erosion in central New York, G. R. FREE, E. A. CARLETON, J. LAMB, JR., and A. F. GUSTAFSON ([*New York*] *Cornell Sta. Bul.* 331 (1946), pp. 30, illus. 10).—Results presented in this bulletin apply to the rolling, glaciated limestone soils of central and northwestern New York and to land eastward along the Mohawk River. Experi-

ments were conducted at the Marcellus and Geneva, N. Y., stations of the U. S. D. A. Soil Conservation Service, in cooperation with the station. The principal soils at the Marcellus station are Honeoye silt loam and Honeoye gravelly silt loam, and the soils at Geneva that were used for experimental work were Ontario sandy clay loam and Dunkirk silty clay loam. Studies of seasonal occurrence of soil erosion indicated that heavy summer thundershowers usually cause the greatest amount of erosion. Detailed information is presented on the periods of excessive rain and the extent of erosion that has taken place as a result of the excessive rainfall. Factors that influence winter and spring erosion are considered. The effects of past erosion were shown from studies of different physical and chemical properties of soil. This erosion has resulted in soil crust formation that gave poor stand and crop growth. Loss of organic matter increases erosion, and erosion removes organic matter because of its lighter weight and because so much of it is in the topsoil. A considerable portion of the bulletin is devoted to the presentation of practical systems of soil management intended to reduce the harmful effect of excessive soil and water losses.

[Soil survey Reports, 1936 Series] (*U. S. Dept. Agr., Bur. Plant Indus., Soils, and Agr. Engin. [Soil Survey Rpts.], Ser. 1936, Nos. 22, pp. 83+, about 10 illus.; 23, pp. 72+, several illus.*).—These surveys were made in cooperation with the State experiment stations as respectively noted: 1936, Nos. 22, the Salt Lake area, Utah, D. S. Jennings et al. (Utah Expt. Sta.); and 23, Martin County, Ind., H. P. Ulrich et al. (Ind. Sta.).

Shall we apply fertilizer with the plow? A. C. CALDWELL, J. M. MACGREGOR, and C. O. ROST (*Minn. Farm and Home Sci. [Minnesota Sta.], 3 (1946), No. 2, pp. 6-7, illus. 3*).—This article presents information obtained on the value of plowing under fertilizers on different soil series in several counties of Minnesota with field corn, alfalfa, soybeans, and navy beans. The results are summarized in recommendations which point out that for most of the better soils, such as the Clarion-Webster soil types, heavy application of fertilizer is not needed to obtain good yields of either field or seed corn. Soybeans likewise failed to give a response on these soils. Alfalfa yields were increased by plowing down fertilizers, but the same results were secured by fertilizer applied broadcast. On the less fertile soil types, plowing under fertilizer was found to give more promising results. One year's results with corn on sandy soils indicated profitable return from small amounts of nitrogen fertilizer plowed under.

Fertilizer recommendations in Mississippi, 1946, C. DORMAN (*Mississippi Sta. Cir. 124 (1946), pp. 11*).—The five grades of mixed fertilizers available for 1946 are considered in relation to crop and soil needs, and fertilizer recommendations are presented for the various soil areas of the State.

Utah fertilizer recommendations for 1946, D. W. THORNE and H. B. PETERSON (*Farm and Home Sci. [Utah Sta.], 7 (1946), No. 1, pp. 1, 9-11*).—In a brief statement prefatory to the specific State recommendations, the author noted that a fertilizer supply better than that of 1945 was to be expected though a somewhat short supply for early spring application was probable; that the past year has brought a rapidly expanding demand for concentrated ammonium phosphate fertilizers (11-48-0 and 16-20-0); and that ammonium nitrate, the physical properties of the fertilizer preparations of this salt having been greatly improved, is now one of the best nitrogen fertilizers to buy. Recommendations are largely concerned with advice as to substitutes for the brands usually purchased. It is noted that ground rock phosphate, though annually produced in Utah or imported, has shown no

value in the States of the arid West. No potassium deficiency in Utah soils having been observed, purchase of fertilizer mixtures containing this element is not recommended.

Band placement of fertilizers near the plant row is recommended as more efficient and economical than the broadcast application and harrowing which have been customary in the State.

Commercial fertilizers report for 1945, E. M. BAILEY (*Connecticut [New Haven] Sta. Bul. 492 (1945), pp. 40*).—This bulletin presents the usual data for 1945 on fertilizer inspection, classification, and analysis.

Fertilizer inspection, analysis, and use, 1944, M. F. MILLER, L. D. HAIGH, E. W. COWAN, and J. H. LONG (*Missouri Sta. Bul. 493 (1945), pp. 43*).—This bulletin presents the usual statistics on fertilizer inspection, analysis, and use, and includes a revised list of approved fertilizer mixtures.

AGRICULTURAL BOTANY

Proceedings of local branches of the Society of American Bacteriologists (*Jour. Bact.*, 51 (1946), No. 3, pp. 401-410).—Abstracts of the following papers of interest to microbiology are included: Submerged Culture of Molds for Amylase Production, by F. Stewart, R. E. Scaif, and W. H. Stark (pp. 401-402); Mutation of *Aspergillus niger* Van Tieghem by Means of Soft X-Rays, by V. M. Diller, A. A. Tytell, and H. Kersten (p. 404); On the Efficiency of Cotton Plugs in Maintaining Sterility, by O. K. Stark (pp. 404-405); Vitamin Requirements of the Photosynthetic Purple Bacteria, by S. H. Hutner (p. 405); Fungus Deterioration Testing—A Chemist's Contribution, by J. Marshall (p. 406); A Micro-Plate Method for Penicillin Assay, by E. R. Jackson (p. 407); and Production of Antibiotic Substances by Basidiomycetes, by W. J. Robbins, A. Hervey, and F. Kavanaugh (p. 410).

Simple photometric method of determining the rate of bacterial growth, N. V. NEEDHAM (*Nature [London]*, 157 (1946), No. 3986, pp. 374-375, illus. 1).—A compensated photometric circuit—here described and illustrated—has been devised for determining relative bacterial densities. Apart from its value in assaying disinfectants, the apparatus was used by the author in determining how the rate of bacterial growth is affected by time of incubation and by variations in the composition of the medium, in pH, and in size of inoculum.

Sterile milk for background in capsule staining, G. C. WEBER (*Stain Technol.*, 21 (1946), No. 2, p. 75).—Maneval has described a staining technic for demonstration of bacterial capsules, with albumin used as a background (*E. S. R.*, 85, p. 326). The present author suggests sterile litmus milk as proving better for the purpose than albumin.

The antibacterial activity of protamine zinc insulin, C. H. BOLLENBACK and S. W. Fox. (Iowa Expt. Sta. et al.). (*Science*, 103 (1946), No. 2676, pp. 445-446).—The experiments here briefly recorded indicate that protamine is able to act as an antibacterial, even though combined in relatively insoluble form with insulin. The test organisms were *Lactobacillus arabinosus*, *Staphylococcus aureus*, and *Escherichia coli*.

Antibiotic material from *Bacillus licheniformis* (Weigmann, emend. Gibson) active against species of mycobacteria, R. K. CALLOW and P. D. HART (*Nature [London]*, 157 (1946), No. 3985, pp. 334-335).—Fractionation of the crude concentrate of the antibiotic material yielded an active precipitate—free from carbohydrate—with Reinecke's salt, and a polysaccharide fraction devoid of activity; from the Reineckate an amorphous material was obtained which gave a positive Sakaguchi test and had an activity of 800,000 units per

gram. It is believed that more than one antibiotic is present in cultures of *B. licheniformis*.

Bacillin, a new antibiotic substance from a soil isolate of *Bacillus subtilis*, J. W. FOSTER and H. B. WOODRUFF (*Jour. Bact.*, 51 (1946), No. 3, pp. 363-369).—A new antibiotic, bacillin—obtained from a soil isolate of *B. subtilis*—was found highly active against both gram-negative and gram-positive bacteria in certain media. Its differentiation from known antibiotics derived from similar bacteria, conditions relating to its production in solid and in liquid media, purification procedure for obtaining highly potent concentrates, and some chemical properties are described. Crude bacillin concentrates proved moderately toxic for mice and completely ineffective in protecting the animals from virulent bacterial infections. The presence in the medium of blood and other complex natural materials reduces or abolishes the antibacterial properties of bacillin.

Antibacillin, a naturally occurring inhibitor of bacillin, H. B. WOODRUFF and J. W. FOSTER (*Jour. Bact.*, 51 (1946), No. 3, pp. 371-380).—Naturally occurring complex organic materials were found to contain an organic substance, "antibacillin," which counteracted the antibacterial action of the antibiotic bacillin. Inorganic salts and H_2S also had this property. Antibacillin was liberated on hydrolysis of gelatin or casein. It failed to destroy or combine with bacillin, probably acting competitively with the latter for vital systems in susceptible bacteria. The chemical properties of antibacillin are given, as well as details for the preparation of concentrates of the active fraction from gelatin and from *Penicillium notatum* mycelium.

An antibacterial pigment from *Fusarium javanicum*, H. R. V. ARNSTEIN, A. H. COOK, and M. S. LACEY (*Nature [London]*, 157 (1946), No. 3985, pp. 333-334).—A preliminary report.

Wisconsin research helped supply penicillin (*Wisconsin Sta. Bul.* 468 (1945), pp. 48-52, illus. 1).—A brief summary of investigations by the station which aided in speeding up the manufacture of penicillin, including studies on growth conditions, constituents of the medium, assay methods, and antiseptics for control of contamination.

Metabolic changes in submerged penicillin fermentations on synthetic media, H. KOFFLER, S. G. KNIGHT, W. C. FRAZIER, and R. H. BURRIS. (Wis. Expt. Sta.). (*Jour. Bact.*, 51 (1946), No. 3, pp. 385-392, illus. 2).—Addition of ash from corn steep to a medium consisting of lactose, dextrin, and mineral salts caused a remarkable increase in penicillin yields in shake flask fermentations. When phenylacetamide also was added, penicillin yields were even greater, being as high as or higher than those previously obtained on corn steep media. Boric acid may slightly stimulate the penicillin formation. Corn steep ash had a distinct accelerating influence on mold metabolism. *Penicillium chrysogenum* X-1612—grown on ash media—utilized sugars and NH_3 more rapidly and to a much greater extent than on the medium without the added ash. Not only the synthetic processes but also the decomposition was conspicuously accelerated by adding corn steep ash; the rate at which the NH_3 nonbasic N, and basic N fractions were excreted was considerably faster in ash media than without the added ash. During the disintegration of the mold, NH_3 was by far the most abundant N compound determined. The concentration of amino N and basic N compounds was low, and amide N was either absent or present only in traces. The compounds of the nonbasic fraction, however, were excreted in slightly greater amounts—and more rapidly in ash-treated than in ash-free fermentations. Ammonia levels were always considerably lower with the added corn steep ash, and in such media NH_3 was almost completely exhausted during growth of the mold.

The action of sulfonamides on certain fungi pathogenic to man, F. T. WOLF (*Mycologia*, 38 (1946), No. 2, pp. 213-219).—Sulfanilamide was found very fungistatic to *Tricophyton mentagrophytes*, *T. rubrum*, *Epidermophyton floccosum*, *Microsporum canis*, *M. gypseum*, and *Sporotrichum schenckii* in vitro; it had no definite fungistatic action on *Candida albicans*, *C. krusei*, *C. tropicalis*, *C. parakrusei*, *C. pseudotropicalis*, *Cryptococcus neoformans*, *Monosporium apiospermum*, *Hormodendrum pedrosoi*, *H. compactum*, and *Phialophora verrucosa*. Sulfathiazole, sulfadiazine, and sulfaguanidine were not appreciably fungistatic toward any of these fungi under the in vitro conditions used. There are 25 references.

A dictionary of the fungi, G. C. AINSWORTH and G. R. BISBY (*Kew, Eng.: Imp. Mycol. Inst.*, 1945, 2. ed., pp. 431+, illus. 138).—The principal changes and additions in this edition of the work previously noted (E. S. R., 91, p. 390) consist in the listing of new genera (with the years made), a new arrangement of the Phycomycetes, a systematic arrangement of the genera, and short notes on more than 50 important mycologists. Changes made by G. W. Martin in his keys to the fungus families are also included.

Three new Zoopagaceae subsisting on soil amoebae, C. DRECHSLER. (U. S. D. A.). (*Mycologia*, 38 (1946), No. 2, pp. 120-143, illus. 6).—Apart from the descriptions of these three new species isolated from decaying plant material—*Cochlonema agamum*, *Acaulopage lophospora*, and *A. hystricospora*—supplementary comment is supplied on an amoeba-capturing form (*Stylopage rhabdospora*). Of the three new species the first acts as an endoparasite; the other two are predators.

Illustrations of the fleshy fungi of Iowa—VI, Fleshy poroid forms, J. C. GILMAN. (Iowa State Col.). (*Iowa Acad. Sci. Proc.*, 51 (1944), pp. 191-197, illus. 5).—The five species of fungi illustrated in this contribution (E. S. R., 91, p. 264) are found in two of the families of the larger fungi—the Polyporaceae and the Boletaceae.

Flora fungosa Chilena: Indice preliminar de los huéspedes de los hongos chilenos y sus referencias bibliográficas [Fungus flora of Chile: A preliminary list of the hosts of Chilean fungi, with bibliographical references to them], F. MUJICA R. and C. VERGARA C. (*Santiago: Imp. Stanley*, 1945, pp. 199).—An index of the common and scientific names of the plants is included.

Plants of Hawaii National Park illustrative of plants and customs of the South Seas, O. DEGENER (*Ann Arbor, Mich.: Edwards Bros.*, 1945, pp. 314+, illus. 141).—This book was first published under the title of Illustrated Guide to the More Common or Noteworthy Ferns and Flowering Plants of Hawaii National Park, with Descriptions of Ancient Hawaiian Customs and an Introduction to the Geological History of the Islands, appearing in 1930. Since then the author has continued his studies of the flora of the South Seas and of the customs of the South Sea Islanders. Moreover, he lived for 8 mo. with the Fiji Island natives, part of the time as the "adopted father" of a bright Fijian youth, thus learning some of the native lore not generally available to the ordinary white colonial. These continued studies have convinced the author (1) that many of the plants of the Hawaiian Islands grow likewise in other islands of the Pacific or have close relatives there, and (2) that many of the customs of the ancient Hawaiians are identical with those of the present inhabitants of other Pacific islands or may be considered modifications of such customs. On account of the special current interest in the plants and customs of the Pacific, "the present volume has been reproduced as a quick, inexpensive, wartime edition to meet this demand under the new subtitle of 'Plants and Customs of the South Seas.'"

Ethnobotany of western Washington. E. GUNTHER (*Wash. Univ. [Seattle] Pubs., Anthropol.*, 10 (1945), No. 1, pp. 61, illus. 1).—The subject matter in the main body of the text—"the plants and their uses"—is arranged on the systematic basis from the Polypodiaceae to the Compositae, with a final short section on miscellaneous plants (fungi, algae, mosses, and a lichen). A chart lists the plants discussed in the text, and a subject index is provided.

American species of Amelanchier. G. N. JONES. (*Univ. Ill.*). (*Ill. Biol. Monog.*, 20 (1946), No. 2, pp. 126, illus. 55).—This taxonomic monograph includes a bibliography and description of the genus and keys to flowering and fruiting specimens of the species; descriptions and discussion of the 22 individual entities, involving nomenclatorial change in only one case—*A. arborea alabamensis* n. comb.; and a list of numbered exsiccatae. An index to plant names is provided.

A seed key to fourteen species of Geraniaceae. M. MURLEY. (*Iowa Expt. Sta.*). (*Iowa Acad. Sci. Proc.*, 51 (1944), pp. 241-246, illus. 28).—The present contribution on the plant family Geraniaceae is the first publication in a program of seed identification initiated in the seed laboratory of Iowa State College.

Host specificity amongst root-nodule bacteria isolated from several clover species. J. M. VINCENT (*Jour. Austral. Inst. Agr. Sci.*, 11 (1945), No. 3, pp. 121-127).—The results are reported for 18 strains of root nodule bacteria, isolated mostly from several clover species growing in recorded locations and tested for ability to fix N in association with 4 host-plant species; in most cases some information was also obtained on the serological constitution of the strains. The data emphasized the importance and complexity of the organism-host relationship. The 18 strains set out against the 4 hosts provided no less than 7—possibly more—patterns of effectiveness. The 4 test hosts may be regarded as differing in their compatibility at least with respect to these 18 strains; subterranean and ball clovers showed a significant agreement in their behavior to the same strains. The findings fail to substantiate the striking field-host to test-host relationship reported by Strong (*E. S. R.*, 77, p. 172), except with respect to isolations from red clover tested with subterranean or ball clover. There is no relationship between effectiveness patterns and what is known of serological behavior, but some likelihood that strains coming from the same area might show a degree of common behavior in their host relationships.

Studies on germination and seedling growth.—III, Early growth in relation to certain aspects of nitrogen metabolism in the seedling of barley. R. BROWN (*Ann. Bot. [London]*, n. ser., 10 (1946), No. 37, pp. 73-96, illus. 7).—In this phase of the study (*E. S. R.*, 90, p. 597), two culture series were run—one of the seedlings grown normally attached to the rest of the seed and another of seedlings excised from seeds that had been in contact with water for 2 hr.; both series were cultured under the same conditions and in contact with water over a 96-hr. period. For each series data are given indicating the change with time in dry and fresh weights, gaseous exchange, and levels of total, soluble, protein, residual soluble, total amino, amide amino, and non-amide amino N.

The fresh weight of the isolated seedlings increased rapidly to 48 hr. and then remained more or less constant; that of the attached seedlings increased slowly to 48 hr. and rapidly thereafter. At 48 hr. the fresh weight of the isolated was greater than that of the attached seedlings; this difference was attributed to a higher water availability in the former. The dry weight of the isolated seedlings fell during the first 12 hr. and again—more slowly—

during the final 84 hr. The preliminary decrease is attributed to leaching; the fall during the final period is believed due to respiratory losses. The dry weight and total and protein N of the attached seedlings increased in two phases, the first being one of slow and the second one of rapid increase; the transition from the first to the second phase occurred between 48 and 60 hr. and was probably complete within 6 hr. In the attached seedlings fresh weight increase in the first and second phases, dry weight in the second, total N increase in the first and second, and protein increase in the second are believed to be exponential.

The exponential increase in each phase and the abrupt rise in the relative rate of increase indicate, it is suggested, that absorption of nutrients from the endosperm is largely determined by the growth reactions of the seedling itself. The water content increased in the isolated seedlings up to 48 hr. and in the attached throughout the experimental period, indicating cell extension over corresponding times. The evidence suggests that in cell extension there is a deposition of dry matter and of protein N, the increases occurring exponentially in a system which itself is expanding exponentially. In the isolated seedling at 2 to 36 hr. and again at 60 to 96 hr. amino N increased by the hydrolysis of constituents of the residual soluble N fraction; at 36 to 60 hr. both residual soluble and total amino N increased by protein hydrolysis. These changes were related to simultaneous changes in the growth process. In the attached seedling, residual soluble N remained more or less constant at 2 to 48 hr. and then increased; total amino N increased continually from the beginning of the experiment. In terms of the percentage of each of these fractions of the total soluble N, during the first phase residual soluble N decreased continuously and amino N exhibited a complementary increase; after 48 hr., however, the proportion of each in the total soluble fraction tended to remain constant. These changes are believed to indicate a profound change in the metabolic situation that coincides with the change in growth rate.

The evidence suggests that the respiration rate in both series was determined by the level of nonamide amino acids, and that the accumulation of amide was related to this condition. Changes in rate of water intake and of cell extension did not coincide with changes in the rate of O₂ uptake; it is suggested that cell extension is not limited by the respiration rate. These findings fail to provide any indication as to the origin of the abrupt change in the development of the attached seedling occurring at 48 hr.; it is not determined by the breaking of the seed-coat membranes, since this happens at least 24 hr. earlier. There are 18 references.

Annual increase of underground materials in three range grasses, J. E. WEAVER and E. ZINK. (Univ. Nebr.) (*Ecology*, 27 (1946), No. 2, pp. 115-127, illus. 6).—Separate lots of three range grasses were grown in large steel drums and at the end of each summer their root systems were freed of soil, photographed, and their dry weights obtained. Roots of big bluestem produced 152 gm. dry weight the first year; this increased 72 percent the second summer and 23 percent the third. During the second year increase in weight was greatest in the first 4-in. level; during the third year, in the 4- to 12- and 12- to 24-in. depths. Little bluestem produced 89 gm. of roots the first year and 86 percent the second, after which their weight declined slightly. Most rapid increase the second year was in the surface foot, especially in the first 4 in. Blue grama produced 76 gm. of roots the first year and reached its maximum the second, with increases mostly in the 4- to 12-in. depth but also with 59 percent in the second foot. Big bluestem reached its approximate maximum

root development the third summer; both little bluestem and blue grama, a year earlier. The underground materials produced in 3 yr. were very similar in amounts to those ascertained earlier in typical mature stands in native prairie; they were also very nearly the same in the surface 4 in.—and especially in the surface 12 in.—as the average amounts found by extensive sampling in climax prairie dominated by each species, respectively. Roots alone yielded about 5.5 tons per acre after 3 yr. in big bluestem, 2.7 in little bluestem, and 1.6 tons in blue grama. Of these amounts, 43, 36, and 49 percent occurred in the surface 4 in. and 78, 69, and 80 percent in the first 12 in. The effects of grass roots in producing a granular soil structure, the time required for completing the structure-forming effect, the decrease or loss of soil granulation under continuous cropping to cereals, and the restoration of good structure and fertility by growing perennial grasses are all considered.

Studies in the physiology of leaf growth.—II, Growth and structure of the first leaf of rye when cultivated in isolation or attached to the intact plant, R. S. DE ROPP (*Ann. Bot. [London], n. ser., 10 (1946), No. 37, pp. 31–40, illus. 6*).—In this further study (*E. S. R., 94, p. 605*), growth of the first leaf attached to the isolated stem tip of rye was compared with that of the first leaf attached to the intact plant. Growth of the isolated first leaf was shown to be due to the development of cells already present; in the absence of roots, cell division in the basal meristem of the leaf failed to occur. Growth of the attached first leaf depended mainly on the activity of the basal meristem during the first 3 days after germination. Differentiation in the attached leaf began at the tip and proceeded toward the base. No clearly defined meristem was observed in the coleoptile; its growth seemed to be mainly from elongation of already existing cells.

Use of a constant-temperature water bath as a culture chamber, J. H. CRAFT (*Iowa Acad. Sci. Proc., 51 (1944), pp. 175–176, illus. 1*).—In the course of experiments on excised leaves of *Bryophyllum calycinum* a need arose for a culture chamber in which light, temperature, and humidity could be controlled simultaneously; the chamber described and illustrated is said to meet these requirements and to be capable of providing a wide range of environments which should make it useful in the culture of micro-organisms.

The physiology of plant growth with special reference to the concept of net assimilation rate, R. F. WILLIAMS (*Ann. Bot. [London], n. ser., 10 (1946), No. 37, pp. 41–72, illus. 9*).—Net assimilation rate is defined as the rate of increase in the dry weight of a plant per unit of active “growing material;” an attempt is here made to evaluate leaf area, weight, and protein as indexes of this “internal factor” for growth. The derivation of the formulas for calculating mean values of relative growth rate and net assimilation rate over specified time intervals is discussed, and the approximate nature of the formula for net assimilation rate is stressed. A method based on graphical interpolation is described for estimating mean values of net assimilation rate in cases where it is known that considerable error may be introduced by direct use of the approximate formula; failure to eliminate such errors may invalidate attempts to relate net assimilation rate to environmental factors.

Following a review of the literature (44 references), a growth experiment with *Phalaris tuberosa* is described; this was limited to the vegetative growth phase, and nutrient treatments comprised two levels each of N and P in all combinations, six harvests being taken at 14-day intervals. Tiller counts showed that early meristematic activity was stimulated more by P than by N, and that the effect of N was delayed and was then greater at the higher

levels of P. These effects were reflected in the dry-weight data for total plant, leaves, and stems, but not in those for roots. Protein N data for the leaves revealed that P is directly concerned in protein synthesis. The data for relative growth rate and net assimilation rates (dry-weight and protein bases) are examined in detail, leaf protein proving more adequate than leaf weight as an index of the internal factor for growth. In general, it may be said that leaf area and weight are suitable indexes of active growing material only during early vegetative growth, but that the leaf protein is suitable for a considerably longer period, provided N is in short supply. Attention is drawn to the errors in net assimilation rates based solely on subaerial parts; such errors are inevitable in analyses of field-grown crops.

New carriers for plant growth regulators, R. B. WITHROW and F. S. HOWLETT. (Ind. and Ohio Expt. Stas.). (*Plant Physiol.*, 21 (1946), No. 2, pp. 131-139).—Formulas and methods of preparation for several stable fluid and cream emulsions employing waxes other than lanolin and emulsifying agents other than triethanolamine stearate are presented; mucilage solution formulas are also given. The cream emulsions do not leave sticky residues as does lanolin; they are also non-toxic to plant tissues. Tomato fruit set well when these emulsions were used as carriers for indolebutyric acid. Under high temperatures where lanolin emulsions are toxic, the materials recommended were nontoxic; they are also said to offer advantages where physiologically inert carriers are desired for materials other than growth regulators.

Geotropic reaction of leaves and content of growth hormone in plants, L. P. ZHDANOVA (*Compt. Rend. (Dok.) Acad. Sci. U. R. S. S.*, n. ser., 49 (1945), No. 1, pp. 62-65, illus. 2).—Based on studies of leaves of hydrangea, perilla, mustard, and Jerusalem-artichoke, it is concluded that the geotropic reaction of leaves severed from the plant does not occur unless they are oriented with their dorsal sides upward; it is lacking under the opposite orientation. This situation is explained by the difference in anatomical structure of the opposite sides of the petiole and a corresponding difference in their reaction to growth hormones. Epinasty and hyponasty of the leaves is believed to depend on the concentration of the growth hormone and on the difference in intensity of the growth processes between the ventral and dorsal sides of the petiole. The degree of geotropic response of the leaves depends on the content of growth hormones synthesized in the apical buds of the stem.

A growth factor in certain vegetable juices, D. METCALF, G. J. HUCKER, and D. C. CARPENTER. (N. Y. State Expt. Sta.). (*Jour. Bact.*, 51 (1946), No. 3, pp. 331-334, illus. 1).—It appears that there is present in tomato and certain other vegetable juices an unidentified growth-accessory substance. This "T" factor may act in conjunction with thiamine, but its heat-stable properties indicate it to be distinct from thiamine. The T factor was also found in liver, string beans, carrots, beets, onions, cabbage, peppers, spinach, and orange juice.

Histological responses of bean plants to phenylacetic acid, A. G. WHITING and M. A. MURRAY (*Bot. Gaz.*, 107 (1946), No. 3, pp. 312-332, illus. 16).—Young Red Kidney bean plants were decapitated at the second internode and a 2 percent mixture of phenylacetic acid in lanolin was applied to the cut surface. Within 48 hr. the stem tip lightened in color and began to enlarge, about doubling in diameter at 6 days. An apical tumor was evident at 5 days, reaching a maximum at 11 to 15 days, after which growth gradually decreased; many stems were dead at 13 days. Below the cut surface there was marked proliferation on the inner cortical parenchyma, endodermis, and primary phloem parenchyma. The outer cortical parenchyma rays, and pe-

ripheral pith were less active. The derivatives may mature as tracheids or parenchyma, continue as patches of meristematic tissue, or infrequently differentiate as small vascular bundles. After treatment there was increased activity of the cambium; response was slight in the pericycle and secondary phloem, and the epidermis and central pith were inactive. Response at the cut surface resulted in the upward proliferation of a parenchymatous tumor, its central mass being derived from proliferated pith and ray parenchyma, with outer portions from young xylem, cambium, and phloem. Vascularization of the tumor was slight. The small branching strands connected with the vascular bundles of the stem or with bundles differentiated in the pith. Centripetal growth of the tumor filled in the cavity formed by collapse of the central pith. Root primordia were infrequent.

Effect of treating soil and seeds with 2,4-dichlorophenoxyacetic acid on germination and development of seedlings, C. L. HAMNER, J. E. MOULTON, and H. B. TUKEY. (Mich. State Col.). (*Bot. Gaz.*, 107 (1946), No. 3, pp. 352-361, illus. 10).—Many seeds are affected when planted in mineral or muck soil previously treated with this growth substance; concentrations as low as 1 p. p. m. soil were found to affect the germination and growth of many seeds. Although grass seeds can be destroyed, they proved more resistant to the acid than were many others; seeds of six grasses and of white and Red Kidney beans, tomato, cabbage, broccoli, pea, sweetclover, rape, vetch, and alsike clover were used in these experiments.

Movement of 2,4-dichlorophenoxyacetic acid stimulus and its relation to the translocation of organic food materials in plants, J. W. MITCHELL and J. W. BROWN. (U. S. D. A.). (*Bot. Gaz.*, 107 (1946), No. 3, pp. 393-407, illus. 11).—When the above chemical was applied to the outer surface of some species of plants, a stimulus was translocated from the treated region to other parts, where a visible growth response occurred. The effects of light, CO₂, location of treatment, and stage of development of the plant on the rate of translocation of such a stimulus in snap bean plants was recorded. The stimulus from treatment with this acid was not readily translocated from the leaves when the sugar content was relatively low, as in those exposed to extended darkness or to CO₂-free air in the light; it was not translocated from young rapidly growing leaves to the stems. When the acid was applied to the leaves, the translocation of the resulting stimulus was closely associated with that of organic food materials. Movement of the acid stimulus from the leaves appeared to occur as a continual flow under conditions favoring carbohydrate translocation and was confined to living cells—probably those of the phloem or parenchyma. When the acid was applied to the root system, however, the resulting stimulus was translocated through nonliving cells of the stem, indicating that it probably traveled in the transpiration stream of the xylem. There are 16 references.

Effect of 2,4-dichlorophenoxyacetic acid on the water relations, the accumulation and distribution of solid matter, and the respiration of bean plants, J. W. BROWN. (U. S. D. A.). (*Bot. Gaz.*, 107 (1946), No. 3, pp. 322-343, illus. 5).—Within an hour after bean seedlings were sprayed with the above acid mixed with Carbowax, those treated with 1,000 p. p. m. showed marked epinastic responses and stem bending, becoming more severe during the next 2 to 3 days; at the end of 5 days the plants were permanently wilted and in 7 days they were dead. The total water absorbed and transpired by sprayed plants during the 5 days immediately after treatment was 34 percent less than for comparable controls. Water uptake was not immediately limited by treatment. Leaf growth and expansion were markedly inhibited in both par-

tially expanded leaves and those in terminal buds, even when sprayed with as low as 25 p. p. m. The solid matter in the above-ground part of the plant decreased with 1,000 p. p. m., but increased accumulation of solid matter was noted in the basal region of the stems of plants sprayed with 25, 50, and 250 p. p. m. The rate of water accumulation in the leaves of sprayed plants was depressed; in the stem tissues it was accelerated. On an over-all basis, however, the treated plants had higher percentages of moisture than the controls. The respiratory rate of seedlings measured at three different temperatures was significantly increased from spraying with an aqueous mixture containing 0.1 percent of the growth substance and 0.6 percent Carbowax 1500; this increase was manifest 24 hr. after treatment. The CO_2 output of treated plants was about 19 to 80 percent greater than that of controls when sampled during 4 days. Annual wild morning-glory plants sprayed similarly at time of flowering exhibited an 80.6 percent increase in respiration during a 2-hr. period on the fourth day after treatment.

The effect of desiccation on the activity and moisture content of bakers' yeast, J. OYAS and M. J. JOHNSON. (Wis. Expt. Sta.). (*Jour. Bact.*, 51 (1946), No. 3, pp. 393-395, illus. 1).—Commercial bakers' yeast dried at low vapor pressures (0.0016 to 0.1 mm. mercury) retained 0.03 gm. of water per gram of yeast. No additional water was removed by drying over concentrated H_2SO_4 . Activity of the yeast as measured by amount of anaerobic CO_2 production fell about half its original value when the yeast was dried at 10 mm. vapor pressure, but drying at lower vapor pressures caused no further loss of activity.

Viability of yeasts preserved two years by the lyophil process, L. J. WICKERHAM and M. H. FLICKINGER. (U.S.D.A.). (*Brewers Digest*, 21 (1946), No. 4, pp. 55-59, 65, illus. 2).—This process is described; by its use 1,161 strains were preserved for an average of 2 yr., 3 mo., 98.1 percent of these yeasts being alive at the end of the period. The approximately 2 percent failing to survive are believed capable of successful preservation by observing their special culture requirements. The advantages of the method are discussed.

Die Blattanalyse: Die wissenschaftlichen und praktischen Grundlagen einer pflanzenphysiologischen Methode der Bestimmung des Düngerbedürfnisses des Bodens [Leaf analysis: The scientific and practical bases of a plant-physiological method of determining the fertilizer needs of the soil], H. LUNDEGARDH (*Jena: Gustav Fischer*, 1945, pp. 164+, illus. 29).

The soluble nitrogen fractions of potato tubers; the amides, F. C. STEWARD and H. E. STREET (*Plant Physiol.*, 21 (1946), No. 2, pp. 155-193, illus. 6).—In this fifth of a series of papers on the biochemistry of salt absorption by plants, the primary purpose is to establish the identity of the amides of the potato and to suggest such refinements as are now known to be necessary in the methods for their indirect analysis. A survey of the literature (72 references) is presented on the biochemistry of the tissues under conditions conducive to salt absorption and on other pertinent data. The experimental work reported concerns (1) a critical reexamination of the analytical procedures used to estimate the soluble N fractions of the tuber, (2) isolation of the crystalline amides therefrom, and (3) the separation of these amides as pure substances and their final identification. For extracting amides, aqueous extracts were found preferable to 70 percent alcoholic extracts of fresh tissue. A complete account of the alcohol-soluble N and of the N content of purified aqueous extracts can be given in terms of $\text{NH}_3\text{-N}$, easily hydrolyzable amide-N, asparagine amide-N, and true amino-N. Methods giving the best results for deter-

mining these fractions are described in detail. The effect of lead acetate precipitation followed by mercuric nitrate precipitation or precipitation by the Neuberg and Kreh reagent (mercuric acetate) on all soluble N fractions was determined, as well as the effect of phosphotungstic acid on the N compounds after liberation from the mercuric precipitates. In the light of these results the procedure for preparing crystalline amides from the tuber was perfected. Crystalline products containing the amides were submitted to repeated crystallizations; by a process described, tyrosine, glutamine, and asparagine were prepared in pure form. Elementary analyses, melting points, and analyses of the amide- and amino-N contents of the crystalline products were all consistent with their identity as the pure substances designated. The yield of glutamine was greater than in any previous report, and the method described should render possible its isolation in high yield even in the presence of greater quantities of asparagine. The identification of the easily hydrolyzable fraction of potato as glutamine, together with its known reactions, reemphasizes the key position already assigned to this amide in protein synthesis. The significance of glutamine seems to be that as the soluble N passes through it the amino groups become particularly susceptible of being "donated" during amino acid formation and the amide group constitutes a particularly labile source of N for synthesis. Further investigation of the amidase and the supposed aminophorase systems of potato are necessary; the nutritional effect of the α -keto acid supply should also be determined.

Influence of carbohydrate and nitrate-nitrogen nutrition on development of hypocotyledonary buds in flax. V. EGGERS (*Bot. Gaz.*, 107 (1946), No. 3, pp. 385-390, *illus.* 2).—It was apparent from the experimental results reported that the nutritional status of the plant has a decided effect on the time and frequency of bud formation and development in decapitated hypocotyls of flax.

A high carbohydrate supply, found in plants receiving a full amount of sunlight, resulted in earlier development of buds than in those on a low carbohydrate supply from shading. A greater number of these plants produced buds—and with the average number greater—than in the low carbohydrate group. Within the two groups, a variation in the nitrate-N content of the nutrient solution had a direct relation to the number of plants producing buds and to the number developed. In the shaded plants with restricted carbohydrate supply, fewer buds were formed owing to decreased amounts of nitrate N in the nutrient supply than in those with a larger amount of carbohydrate. Under the conditions, the maximum supply of both nutrients resulted in maximum bud production; minimum production was in plants high in carbohydrates but low in nitrate N.

Development of some recent concepts in the physiological chemistry of the tobacco alkaloids. R. F. DAWSON (*Plant Physiol.*, 21 (1946), No. 2, pp. 115-130).—This critical review (49 references) of the physiological functions of tobacco alkaloids and of the mechanisms by which they are synthesized within the plant cell revolves around the distribution of nicotine in the growing plant, the locus of its formation, the extent and nature of its transport, the nature of the nicotine synthetic process, the synthesis of secondary tobacco alkaloids, and the physiological significance of nicotine.

Tannin production from native species of sumac. I. L. BOYD. (Iowa Expt. Sta. and U. S. D. A.). (*Iowa Acad. Sci. Proc.*, 51 (1944), pp. 171-174, *illus.* 1).—A summary of an investigation over a 5-yr. period of four species of sumac among which the value of *Rhus glabra* is emphasized as in a report previously noted (*E. S. R.*, 93, p. 20).

Further investigation of toxic substances which arise from guayule plants: Relation of toxic substances to the growth of guayule in soil, J. BONNER (*Bot. Gaz.*, 107 (1946), No. 3, pp. 343-351, illus. 1).—Guayule plants have previously been shown to produce inhibitory substances (E. S. R., 92, p. 634), but in the present study it was not possible to detect these inhibitory substances in any of three soils in which guayule had grown in the nursery or field for 2 to 8 yr. It is believed that the toxic materials released from guayule must be destroyed or inactivated in the soil under favorable field conditions. It is conceivable that the infertility of a particular soil toward guayule might be related to accumulation of cinnamic acid or other toxic substances owing to the absence or failure of the system for neutralizing or destroying the toxic substances. All three soils here used were of high potential fertility for guayule.

Ultra-violet irradiation of spores of certain molds collected from bread, D. B. CONKLIN (*Iowa Acad. Sci. Proc.*, 51 (1944), pp. 185-189).—Under irradiation with a 15-w. General Electric mercury vapor lamp at 2,537 a. u. radiation, all forms collected were rendered inactive by 1.5- to 6-min. exposures. The thick-walled heavily pigmented spores of *Aspergillus niger* proved the most resistant, requiring two to four times the exposure of some of the other mold fungi tested. Inability of the spores to send out mycelium was taken as the criterion of inactivation. Mold spores subjected to intermittent radiation were also inactivated when the total exposure equalled in amount the continuous lethal dose. The presence of inhibitory substances in the medium after prolonged irradiation was not demonstrated.

Effects of various agents on the structural viscosity of *Elodea* protoplasm, H. T. NORTEN. (Univ. Wyo.). (*Plant Physiol.*, 21 (1946), No. 2, pp. 148-154).—Concentrations of 2 percent of ethylene chlorohydrin, 3 thiourea, 4 ether, 6 ethyl alcohol, 3.5 propyl alcohol, and 1.5 percent butyl alcohol, and 0.0001 M cupric chloride and 0.001 M zinc sulfate conditioned decreases in the structural viscosity of the protoplasm at exposures of 2 hr. or less; these decreases were presumed to result from dissociation of protoplasmic proteins. Concentrations one-half those above noted also decreased the viscosity, whereas greater concentrations gave an initial decrease usually followed by an increase. Plasmolysis with 0.6 M sucrose or 0.3 M potassium chloride decreased the viscosity. The viscosity was also lower at 3° than at 21° C. There are 26 references.

Methods for studying the maize ear, R. G. REEVES. (Tex. Expt. Sta.). (*Bot. Gaz.*, 107 (1946), No. 3, p. 425, illus. 1).—For studying the vascular system of the corn ear, the author has developed a retting process involving the use of cellulose-digesting micro-organisms; by this method—here described and illustrated—he reports obtaining excellent material.

GENETICS

Saccharum robustum and other wild relatives of "noble" sugar canes, C. O. GRASSL. (U. S. D. A.) (*Jour. Arnold Arboretum*, 27 (1946), No. 2, pp. 234-252, illus. 8).—On the basis of the morphological and geographical evidence here given, it is suggested that noble sugarcanes are most closely related to *S. robustum* and *Erianthus maximus*. There may have been separate origins of sweet forms in both these groups but it is believed more likely that the main origins were from *S. robustum* and that as these forms were carried eastward beyond the range of wild *Saccharum* they were modified by hybridization with forms of *E. maximus*. Some of the possibilities and prob-

abilities along these lines are discussed. Comparative observations of a large number of original sugarcanes and related wild forms have thus far permitted considerable advance toward elucidation of the origins of sugarcanes. It has become apparent in this study that progress is more certain when all available garden canes and related feral types of an island or region are assembled to compare with similar complete assemblages from other islands or regions. Fortunately some of the regional collections have been on a generous basis; they prove that there are a number of geographic points of origin and satellite regions of modification shown by distinctly different group compositions in different areas. Critical cytological studies of the complex groups involved remain to be made in testing the suggestions here advanced.

Cytological effects of sulfanilamide on *Allium cepa*, J. J. PETERS (Bot. Gaz., 107 (1946), No. 3, pp. 390-392, illus. 1).—As in the case of colchicine, sulfanilamide was found to inactivate the spindle mechanism and delay division of the spindle attachment region. Both chemicals induce polyploidy, but colchicine is more effective since it results in a higher percentage of polyploid cells and a greater degree of polyploidy. Sulfanilamide (0.5 percent), unlike colchicine (0.1 percent), inhibits the entrance of cells into mitosis. Colchicine results in multipolar mitosis; sulfanilamide does not.

Morphology of reproduction in guayule and certain other species of *Parthenium*, K. ESAU (Hilgardia [California Sta.], 17 (1946), No. 2, pp. 61-120, illus. 22).—Morphologic evidence was found of the occurrence of both sexual and apomictic reproduction in guayule, *P. argentatum*. The sexual form was characteristic of the 36-chromosome plants and the apomictic of guayule plants with higher (polyploid) numbers of chromosomes. Apomixis in *Parthenium* involves mainly generative apospory followed by unreduced pseudogamy. Since some flowers on a given plant show stages of apomictic development and others show those of the sexual reproductive cycle, apomixis in guayule is facultative.

Plants characterized by normal sexual reproduction showed an orderly sequence of events in megasporogenesis and in gametophyte development. The morphologic features of apomictic reproduction contrasted sharply with those of sexual reproduction. Embryo-sac formation showed no orderly sequence of stages. Pollination was, however, highly beneficial or, perhaps, even necessary for endosperm development and for the attainment of normal embryo size.

Heritability of live animal scores, grades, and certain carcass characteristics in beef cattle, B. KNAPP, JR., and A. W. NORDSKOG. (U. S. D. A. and Mont. Expt. Sta.). (Jour. Anim. Sci., 5 (1946), No. 2, pp. 194-199).—A study was made of the record of 177 steer calves from 23 sires at the U. S. Range Livestock Experiment Station to estimate the relative effect of heredity on score at weaning, slaughter grade, carcass grade, dressing percentage, and area of cross-section of eye muscle. The animals used were the same as those used for a previous study on weight and gains (E. S. R., 95, p. 42). Heritability was estimated by the use of the paternal half-sib correlation from analysis of variance and in addition from the sire : offspring regression in the case of score at weaning.

Heritabilities obtained by intrasire correlations for the characteristics studied were: Score at weaning 53 percent, slaughter grade 63 percent, carcass grade 84 percent, dressing percentage 1 percent, and area of eye muscle 69 percent. The regression of score at weaning of progeny on sire was negative ($b = 0.07$) and was not significantly different from zero.

It is concluded that though there seems to be less heritability in the meas-

ures of quality of product than in the measures of growth, there is ample opportunity for selection for these characteristics.

Inheritance of skin folds of sheep, J. M. JONES, B. L. WARWICK, R. W. PHILLIPS, D. A. SPENCER, C. B. GODBEY, R. E. PATTERSON, and W. H. DAMERON. (Tex. Expt. Sta. and U. S. D. A.). (*Jour. Anim. Sci.*, 5 (1946), No. 2, pp. 154-169, illus. 4).—Skin folds were recorded and evaluated on 760 rams and 915 ewes of the Rambouillet breed. The records were taken on freshly shorn yearlings. The males had significantly greater skin-fold values than the females. The skin-fold values of all body regions were highly and significantly correlated with each other, with total skin folds, and with total minus the part correlated.

"Regression coefficients for estimating the total skin folds from the record of a part differed by one in each case from those using total minus the part. Either may be used, but that using total skin folds is simpler. The neck regions, top and bottom, may be used either separately or together with a fairly high degree of reliability to replace the record of the entire animal."

Analysis of variance and covariance of parent-offspring groups was made with the progeny of 29 sires. This showed a significant influence of sires. Correlations of other relatives, i. e., dam to daughter, dam to son, half brothers to half brothers, and of half sisters to half sisters were highly significant, and estimates of 45.6 percent and of 51.2 percent heritable portion were found, indicating that definite progress may be expected from selection for or against this character. A few crosses of Rambouillet rams to Corriedale ewes (smooth) were also studied. It is tentatively proposed that lack of skin folds is due to dominant multiple genes, the number not being determined but probably not being extremely large. It is concluded from both phases of the study that skin folds may be easily reduced to a low point by selection alone. "Progeny tests would be necessary only if complete elimination is desired, or if the objective is an intermediate type."

Heritability of face covering and neck folds in range Rambouillet lambs as evaluated by scoring, C. E. TERRILL and L. N. HAZEL. (U. S. D. A.). (*Jour. Anim. Sci.*, 5 (1946), No. 2, pp. 170-179, illus. 3).—Estimates of heritability of face covering and neck folds as evaluated by scoring were calculated from data on 2,183 weanling Rambouillet lambs born in 1941 and 1942 and 892 dam-offspring pairs. Two breeding methods had been followed consisting of inbred lines and top crosses. Estimates based on daughter-dam regressions and half-sib correlations were calculated for each year and breeding method, making eight individual estimates for each trait. Average heritability estimates of 0.56 ± 0.05 for face covering and 0.39 ± 0.05 for neck folds were obtained. No significant differences were found between estimates for years, breeding methods, or methods of estimation. Significant variations between inbred lines were found for each trait. The interpretation of these estimates of heritability in relation to the populations from which they were obtained and their application to breeding programs are discussed.

Nine years of swine breeding bring results, L. M. WINTERS (*Minn. Farm and Home Sci. [Minnesota Sta.]*, 3 (1946), No. 2, pp. 2-3, illus. 3).—This is a review of the Minnesota Swine Breeding Project, initiated in 1936, and deals especially with the development of the Minnesota No. 1 and No. 2 lines.

Cleavage and attachment stages of the pig. W. W. GREEN and L. M. WINTERS. (Minn. Expt. Sta. coop. U. S. D. A.). (*Jour. Morphol.*, 78 (1946), No. 2, pp. 305-316, illus. 10).—This study of the prenatal development of the pig continues the earlier work with the bovine by Winters et al. (*E. S. R.*, 88, p. 181). Segmentation stages of known ages have been recovered from

swine of established lines of breeding, and photomicrographs of fresh, unfixed specimens are presented and discussed.

Constitution of liver and spleen as a physical basis for genetic resistance to mouse typhoid, E. F. OAKBERG. (Iowa Expt. Sta.). (*Jour. Infect. Diseases*, 78 (1946), No 2, pp. 79-98, illus. 8).—Observations are reported on six strains of mice, representative of low, intermediate, and high genetic resistance to mouse typhoid, which had been inoculated intraperitoneally with a dose of 200,000 live *Salmonella typhimurium* organisms of a culture with moderate virulence.

The influence of genetic factors on the transmissibility of fowl sarcomas, A. W. GREENWOOD and P. R. PEACOCK (*Brit. Jour. Expt. Pathol.*, 26 (1945), No. 5, pp. 357-361).—Two strains of chemically induced sarcoma, one derived from a Barred Plymouth Rock fowl, the other from a Brown Leghorn, have been maintained by serial passage in Brown Leghorn fowls. The results show consistent differences in susceptibility to both tumors by four inbred lines of fowls that had been selectively bred for purposes unrelated to cancer studies. The Brown Leghorn derived sarcoma was more easily grown in the Brown Leghorn stock than the tumor derived from the Barred Plymouth Rock, but the latter tumor could not be maintained in related birds. A definite seasonal variation in transmissibility of both tumors has been noted.

A histopathological study of depigmented irises from Single Comb White Leghorns, R. F. BALL. ([N. Y.] Cornell Expt. Sta.). (*Cornell Vet.*, 36 (1946), No. 1, pp. 31-40, illus. 6).—A histopathological study of depigmented and normal reddish bay irises from Single-Comb White Leghorns is presented. As a result of these studies, the reliability of iris color as a criterion in the selection of laying and breeding stock is questioned.

The wing-spot method for color sexing Rhode Island Reds and New Hampshire chicks, R. G. JAAP (*Oklahoma Sta. Cir.* 121 (1946), pp. 8, illus. 9).—The wings of red cockerel chicks were shown to carry an identification mark not present on the wings of their sisters. In baby cockerels the mark was a white or yellowish white spot on the top of the wing in the region of the wing web. Baby pullets were a uniform red in color. Sexing of Rhode Island Red chicks was done with an accuracy of 90 to 95 percent, with somewhat less in New Hampshire chicks, which are lighter colored. The size of the spot on different cockerel chicks was very small or relatively large. The accuracy of this method of sexing may be improved by improved breeding of colors of distinct red.

FIELD CROPS

Establishment of some true prairie species following reseeding, D. R. CORNELIUS. (Kans. Expt. Sta.). (*Ecology*, 27 (1946), No. 1, pp. 1-12, illus. 5).—Big bluestem, little bluestem, side-oats grama, switchgrass, Indian grass, and tall dropseed were used in establishment studies, with seedings in 1940, 1941, 1942, and 1943 on eroded upland near Manhattan, Kans.; the field was typical of areas in the true prairie being retired from grain crops to be used for grazing and hay. Reseeding is much quicker and more economical than waiting for secondary succession to occur. It was about 3 yr. after reseeding before grazing or harvesting of hay could be permitted. During the first season of establishment annual weeds dominated; summer grasses and forbs were abundant and perennial grass seedlings usually inconspicuous, only close observation indicating their presence. The annual weedy grasses were suppressed the second year, and these and the forbs

were negligible the third season. Side-oats grama and switchgrass were established more readily than the bluestems in the first season. One or more seasons of competition favored the last, which increased more rapidly in density than the side-oats grama, switchgrass, or tall dropseed. Both density and yield of vegetation were somewhat less in a virgin prairie near the revegetated field than in the third and fourth seasons of the latter. Perennial legumes and other perennial forbs were present in the native prairie instead of the weedy annual forbs of the revegetated areas. Weedy annual grasses of the virgin prairie were winter annuals in contrast to the summer annuals of the revegetated areas. Apparently the native prairie had not completely recovered from the 1934 drought. Densities of big bluestem and side-oats grama were greater in 1943 than those of little bluestem, which probably had been most important before the drought.

Rye nurse crops in range seeding, L. A. STODDART. (Utah Expt. Sta.). (*Ecology*, 27 (1946) No. 1, pp. 61-64).—In dry years and dry climates, according to the findings reported, rye actually draws from the soil moisture that might otherwise be available for perennial grass. On arid lands, this drying action may kill the perennial grass and will certainly reduce its yield. For this reason the use of a small-grain nurse crop cannot generally be recommended in seeding western grasses. Possible exceptions might be irrigated pastures and high mountain ranges where precipitation is relatively high. Seeding rye with range grasses insures forage within a short time after planting because of the rapid growth of the rye. Damage from trampling and some injury from grazing are, however, likely to affect the perennial grass when grazed less than 1.5 to 2 yr. after planting, despite the plentiful forage supplied by the rye. A preferred method is to divide the range and seed part to rye alone and part to grass. Because of its high yield the rye can immediately support all livestock formerly cared for on the entire range; meanwhile, the grass can be protected without livestock reduction. Rye—properly grazed—will continue to supply forage for 2 to 3 yr.; after this the perennial grass portion of the range can bear the burden of grazing. At this time the rye can be killed by heavy spring grazing or late spring mowing, and grass can be drilled into the rye stubble the following fall. This new grass stand, in turn, should be protected from grazing for about 2 yr. It is therefore recommended that perennial grasses and rye be seeded alone for maximum success in range seeding.

Some effects of competition from cheatgrass brome on crested wheatgrass and bluestem wheatgrass, R. S. RUMMELL. (U. S. D. A. and Iowa State Col.). (*Ecology*, 27 (1946), No. 2, pp. 159-167, illus. 1).—Many attempts have been made to reseed perennial grasses on range lands having dense stands of cheatgrass brome, but with little success; in many cases competition from the latter is believed to have been responsible. Analysis of the results of a greenhouse experiment showed that cheatgrass brome actually did deter the establishment of crested wheatgrass and bluestem wheatgrass seedlings. Highly significant reductions in numbers of seedlings and tillers and in weights of tops and roots of both species followed such competition. For the bluestem seedlings, additional highly significant differences on number and total length of rhizomes and number of shoots from rhizomes resulted. Rhizome production by the bluestem seedlings was reduced from 368 in. in the controls to nothing in the plots where cheatgrass was a competitor; the vigor of the bluestem transplants was also materially lowered by this competition. This loss of vigor was evidenced by highly significant differences in the figures for weight of tops and roots, number of tillers, height of tops, and

length of roots found in the competition as compared with the control plots. Crested wheatgrass made more satisfactory growth than the bluestem with the same degree of competition by cheatgrass brome. Seedlings of crested and bluestem wheatgrass were better able to compete with cheatgrass brome under limited moisture conditions than where the water supply was more adequate.

Trials show way to higher yields from permanent pastures, A. C. ARNY (*Minn. Farm and Home Sci. [Minnesota Sta.], 3 (1946), No. 2, pp. 4-5, 15, illus. 2*).—That carrying capacity of a large proportion of Minnesota's 6 million acres of open permanent pasture could be increased from 35 to 100 percent, or even better, by following thoroughly tried improved practices, was shown by yields on variously treated pastures in southeastern Minnesota. Useful practices include prevention of overgrazing, spreading of droppings and application of manure, use of commercial fertilizers, and renovation by disking, harrowing, and reseeding.

Hay preservatives prove valueless: Tests show that prohibitive quantities would be necessary for effectiveness on stored moist hay, R. B. MUSGRAVE and J. E. DAWSON (*Farm Res. [New York State and Cornell Stas.], 12 (1946), No. 2, pp. 18-19*).—In storage tests in which three 1-ton lots of clover-timothy hay at 31 percent moisture were treated with 0, 1, and 5 lb., respectively, of preparations containing sodium bicarbonate, the treatments did not lessen heating, and moreover all three lots of hay molded badly, had a musty odor, and graded "sample." Laboratory tests to measure amounts of CO₂ evolved by molds growing on hay in storage also gave negative results. Preparations containing sodium bicarbonate, drying agents, or mixtures of the two, evidently offer no promise as a practical solution of problems involved in storage of uncured hay.

North Dakota leads in barley production, T. E. STOA (*North Dakota Sta. Bimo. Bul., 8 (1946), No. 4, pp. 23-27, illus. 3*).—North Dakota ranks first among the States in production of barley. During 1942-45 the production of this crop in the State ranged from about 54 to 67 million bushels, averaging about 60 million, which represents about one-fifth of the United States crop and about one-third of the barley produced in the 12 North Central States. A large acreage and favorable conditions for high yields resulted in a large total production of barley in North Dakota. A short crop in some of the other States, and an increasing industrial demand, has resulted in an increasingly large market for North Dakota barley. Wisconsin 38 is preferred for brewers' malt, L (Kindred), Manchuria, and O. A. C. 21 for distiller's malt, and Tregal and Trebi for feed barley.

Potato varieties grown in North Dakota in 1945, H. MATTSO (*North Dakota Sta. Bimo. Bul., 8 (1946), No. 4, pp. 7-8*).—Cobbler and Triumph, each producing more than 10,000,000 bu. from about 75,000 acres, were the leading potato varieties in North Dakota in 1945, and were followed by Early Ohio on 7,000 acres and White Rose on about 1,700 acres.

Certified seed potatoes prove their value, F. G. BUTCHER (*North Dakota Sta. Bimo. Bul., 8 (1946), No. 4, pp. 9-11*).—Certified seed of the Cobbler variety yielded 27 percent more and Triumphs 32 percent more than non-certified potatoes in demonstration plantings at Park River in 1945. These increased yields appeared due to the greater freedom from various diseases in the certified seed lots.

Oil sprays for the control of weeds in carrots and related crops, B. H. GRIGSBY (*Michigan Sta. Quart. Bul., 28 (1946), No. 3, pp. 201-207, illus. 4*).—Stanisol, Sovasol, oleum spirits, and related oils could be used to give a 95-

percent kill of annual weeds and grasses in carrots. While leaves of perennials, as Canada thistle, nettle, and milkweed, may be killed, these plants recover. Ragweed and beggarticks, although annual plants, are not killed at any growth stage. Although oil sprays will not eradicate all the weeds in a carrot or parsnip planting, on many farms these materials can be used to greatly reduce the amount of hand labor needed for production of these crops. Carrot plants are not usually injured at any stage of growth by these oils. Kerosene and light fuel oils, while less expensive per unit than naphthas, do not give as satisfactory control of weeds and may produce undesirable flavors in carrots. Oil spraying should be done when carrots are in the 2-3 "fern" stage of growth, and a second application if needed may be applied at any time in the following 4-6 weeks. Bunching carrots probably should not receive more than one oil spray, and at least 4 weeks time should elapse between spray application and harvest. From 75 to 100 gal. per acre of sprayed area will give satisfactory control. Recommendations are made for carrot growers whose weeding costs exceed \$25 per acre.

2,4-D kills weeds, B. THORNTON (*Colo. Farm Bul. [Colorado Sta.]*, 8 (1946), No. 1, pp. 3-5, illus. 3).—Tests in 1945, including trials in 38 counties, favor a concentration of 1,000 p. p. m. (0.1 percent) of 2,4-D applied at the rate of 1½ gal. per square rod (240 gal. per acre), applied when the plant is young, succulent, and actively growing, possibly prebloom stage in most instances, and at temperatures of 70° F. or higher at time of application. Shade slows the killing process but does not necessarily affect the final results. High soil moisture and high fertility are associated with good results, that is, are productive of rapid, succulent growth. Spraying pressure of about 100 lb. is recommended.

As to reaction to treatment with 2,4-D, weeds were grouped as promising—bindweed, silverleaf, and woolly-leaved poverty weeds, perennial sowthistle, burdock, curled dock, fanweed, wild lettuce, lawn weeds, willows, cottonwood sprouts, cattails; doubtful—Canada thistle, white weed, Russian knapweed, leafy spurge; and resistant—grasses (tame and weedy), mouse-ear poverty weed, and many others.

HORTICULTURE

Red kidney bean seed presents special problems, M. T. MUNN. (N. Y. State Expt. Sta.). (*Farm Res. [New York State and Cornell Stas.]*, 12 (1946), No. 2, p. 6).—A test planting was made in 1945 of some 60 stocks of red kidney beans, varying in age from 1941 to 1944 production. Among the observations were that age of seed, within reasonable limits, was not important since properly stored seed of 1942 growth gave as even and quick stand as did 1944 seed. Poorly handled 1943 seed, on the other hand, fell away sharply in viability. Depth of planting was not a handicap in the case of strong seed. Mechanical injury, indicated as splits and cracked seed coats, was always reflected in lowered germination. The value of careful germination tests as a measure of value of seed was indicated.

Bush lima beans show promise, W. T. TAPLEY. (N. Y. State Expt. Sta.). (*Farm Res. [New York State and Cornell Stas.]*, 12 (1946), No. 2, pp. 13, 19).—Four new bush lima beans introduced by the U. S. Department of Agriculture were grown in 1945 in comparison with seven established varieties. Fordhook 242, a potato lima type, outyielded the regular Fordhook by nearly 800 lb. per acre and produced more early beans. The two Henderson types, Nos. 243 and 343, outyielded the regular Henderson by large amounts.

The effect of various fertilizer and manure treatments on the yield, size, stand, and disease resistance of cantaloupes, E. M. RAHN and W. H. PHILLIPS (*Delaware Sta. Bul. 256 (1945), pp. 42, illus. 1*).—Experiments conducted over four seasons on Sassafras loamy sand but located each year at a different location led to the general conclusion that the placement of stable manure or mushroom manure in the furrow appears necessary to produce maximum yields. Poultry manure applied as a side dressing proved almost as effective as the other manures, but commercial fertilizer used alone did not produce maximum yields except under conditions of abundant and well-distributed rainfall. Under these favorable conditions, poultry manure produced maximum yields.

When no animal manure was used, 250 to 330 lb. of plant food of 1-2-2 or 1-2-3 ratios was most effective and should be applied in bands 6 in. from the plant row with two-thirds at seeding and one-third later when the vines start spreading. This amount of plant food may be supplied by 1,100 lb. per acre of 4-8-12, 5-10-10, or 5-10-15 fertilizer.

With stable or mushroom manure, 5 to 10 tons per acre should be placed in the furrow and 700 lb. of 5-10-10 or similar fertilizer should be placed in bands at seeding. If growth is not good, a side dressing such as 400 lb. of 5-10-10, 225 lb. of nitrate of soda, or 2.5 tons of chicken manure should be applied later.

Chicken manure was most effective as a side dressing at the rate of 2.5 tons or more per acre after an initial application in bands at seeding of 700 lb. of 2-8-16.

Under dry conditions, when diseases are not severe, plants were not rendered more susceptible to *Macrosporium* leaf spot by high applications of N or P or of chicken manure. With regard to K, the highest infection observed came at the 110 lb. K₂O level, with less infection at higher and lower levels.

In dry years, no correlation was noted between marketable yields and disease injury and while spraying decreased disease, yields were not increased.

Carrots weeded with oil sprays, R. D. SWEET. ([N. Y.] Cornell Expt. Sta.). (*Farm Res. [New York State and Cornell Stas.], 12 (1946), No. 2, pp. 9-10, illus. 1*).—Information is presented on the use of various light oil sprays for the control of weeds in carrot plantings.

Onion investigation at the Utah Station, L. H. POLLARD (*Farm and Home Sci. [Utah Sta.], 7 (1946), No. 1, pp. 8-9, illus. 4*).—This is a brief review of investigations conducted by the station in variety testing; development of new varieties by selection and breeding; and methods of harvesting, curing, and storing.

Nitrogen improves quality, increases yields of peas, C. B. SAYRE. (N. Y. State Expt. Sta.). (*Farm Res. [New York State and Cornell Stas.], 12 (1946), No. 2, pp. 8-9*).—The liberal use of ammonium sulfate, ammonium nitrate, or sodium nitrate, gave marked increases in the yield of Surprise peas and kept the peas in the fancy grade for a longer period. On July 2, 2 days after the unfertilized peas reached a tenderometer grade of 95, the ammonium nitrate and ammonium sulfate lots were still in the same high quality grade. The increase in yield and quality due to the fertilizer treatments was more than sufficient to pay for the cost of the fertilizers. The two ammonium fertilizers were superior to sodium nitrate, and seed inoculation alone did not meet the N requirements necessary to best yield and quality. Good results were obtained with ammonium sulfate applied to Thomas Laxton peas.

Use of 2,4-dichlorophenoxyacetic acid for the improvement of greenhouse tomato production. M. C. STRONG (*Michigan Sta. Quart. Bul.*, 28 (1946), No. 3, pp. 216-225, illus. 7).—A single application per cluster of 2,4-dichlorophenoxyacetic acid (2,4-D) used as a spray (10 p. p. m.) increased the size of tomato fruits over those produced by hand pollination and decreased the period from bloom to maturity by 1 to 2 weeks. A greater increase in number of fruit set by this spray was obtained in the fall than in the spring crop. The percentage of unmarketable fruits was, however, somewhat greater in the hormone-treated than in the hand-pollinated fruits.

Some of the parthenocarpic fruits were hollow and resembled large peppers, while others showed an internal discoloration when opened. Two applications of the 2,4-D spray to a single cluster failed to increase set or fruit weight over one application and caused injury in some cases. Leaf distortion indicated that 2,4-D is absorbed through the flowers and transported through the plant tissues. Spray treatments were most effective on open flowers.

Vapor treatments with 2,4-D increased the set of fruit, but all plants showed marked deformation of the foliage and inhibition in the development of new flower buds.

Minnesota Fruit Breeding Station to introduce 3 new fruit varieties. W. H. ALDERMAN (*Minn. Farm and Home Sci. [Minnesota Sta.]*, 3 (1946), No. 2, p. 13).—Brief descriptions are presented of an apple, crabapple, and strawberry, known respectively as Minnesota 638, Minnesota 240, and Minnesota 1118, which are planned for distribution in 1946.

The Macoun apple—sets fruits in 1945 under adverse spring weather conditions. W. TOENJES (*Mich. Sta. Quart. Bul.*, 28 (1946), No. 3, pp. 189-190).—A brief discussion is presented of the tree, fruit, and bearing habits of the Macoun apple, a variety which in the adverse 1945 season set and matured a full crop while most adjacent trees of other varieties matured little or no fruit.

Apple varieties for the Western Slope. F. M. GREEN (*Colo. Farm Bul. [Colorado Sta.]*, 8 (1946), No. 1, pp. 6-11, illus. 3).—Over a period of years a considerable number of apple varieties have been under test at the Orchard Substation at Austin. The results are discussed, together with comments as to the need and value of new varieties and some of the outstanding features of varieties tested.

Apple-tree pruning wounds—treatment and healing in sound and winter-injured trees. D. S. WELCH and L. H. MACDANIELS ([*New York*] *Cornell Sta. Bul.* 821 (1945), pp. 23, illus. 7).—The durability and persistence of 24 materials were tested by exposure of freshly painted blocks of green apple wood to weathering for 1 yr. White house paint, bordeaux paint, copper resin, and variations of asphalt water emulsions and asphalt paints proved most durable, while orange shellac, blue wagon paint, coal tar paint, red barn paint, Revere Asphaltum, and water glass had practically disappeared from the wood surfaces and the underlying wood was badly checked at the end of the test.

Tests of the toxic effects of the materials on living apple tissues showed no apparent injury from orange shellac, copper resin, fibrated asphalt paint, and asphalt water emulsion. Paints containing linseed oil caused slight injury, as did also fibrated asphalt to which had been added a small quantity of creosote.

A test of 15 selected materials applied on large pruning wounds in winter-injured trees in five orchards resulted in no instance in preventing bleeding or decay of wood below the pruning wounds. The time between the occur-

rence of winter injury and the pruning varied from a few days to several months and the interval between time of pruning and applications of wound dressings varied even more greatly, thus providing a great variability in conditions.

In general the study failed to show any one material as being entirely suitable for treating pruning wounds on apple trees. From the standpoint of durability and freedom from injury to the cambium, asphalt-water emulsion, white house paint, fibrated asphalt paint, bordeaux paint, and copper resin have considerable promise.

Influence of the rootstock on the composition of citrus leaves and rootlets. A. R. C. HAAS. (Calif. Citrus Expt. Sta.). (*Soil Sci.*, 60 (1945), No. 6, pp. 445-461).—Information is presented to show that in addition to boron (E. S. R., 94, p. 338) the rootstock may influence the accumulation of other nutrient elements in the leaves of the scion tops. More Ca and Mg and less K were found in grapefruit and navel and Valencia orange leaves on sour than on sweet orange rootstocks. Valencia leaves of trees on shaddock, trifoliolate orange, rough lemon, and Cleopatra mandarin were relatively high in Mg, whereas leaves of trees on grapefruit were relatively low.

The highest total N in Valencia orange leaves occurred in trees on Koethen sweet orange roots. Sulfur was higher in Valencia leaves on rough lemon, grapefruit, citrange, and most sweet orange rootstocks than in leaves from trees on sour or trifoliolate orange and Cleopatra mandarin stocks. Total P was found relatively high in Valencia leaves from trees on sweet or trifoliolate orange and generally low in leaves from Valencia trees on sour orange, rough lemon, and lemon shaddock roots. Leaves of large seedling sour orange trees contained more Ca and Mg, less total P, and about one-half as much K as did leaves of large seedling sweet orange trees.

The rootlets of sour orange budded with Valencia orange were high in Ca and low in K, total N, S, and P as compared with those of Koethen sweet orange.

It is concluded that for orange trees the relative order or type of absorption of nutrient elements which seedling trees impose on their own leaves resembles in certain respect the order that these seedlings, as rootstocks, impress on the leaves of the scion variety.

Citrus industry of Florida. A. F. CAMP ET AL. (*Tallahassee: Fla. [State] Dept. Agr.*, [n. d.], pp. 199, illus. 86).—This comprehensive discussion covers the various phases of citrus production, including propagation, culture, harvesting, packing house operations, marketing, and processing. Two of the principal articles Citrus Growing in Florida, (pp. 5-140) and Packinghouse Operation (pp. 141-167), were prepared by A. F. Camp of the Citrus Experiment Station at Lake Alfred.

Tung culture in southern Mississippi. S. R. GREER, T. E. ASHLEY, G. F. POTTER, and E. ANGELO. (Coop. U. S. D. A.). (*Mississippi Sta. Bul.* 409 (1944), pp. 26, illus. 12).—The status of tung oil production and importation in the United States is reviewed briefly and general information is presented on selection of sites, preparation of soil, selection of planting stock, planting, fertilizing, pruning, general cultural care, harvesting, etc. Records taken on the yield of a number of young budded varieties showed a great variation ranging in 1944 from 19.0 to 1.5 lb. per tree. Phosphorus plus nitrogen alone or P plus N in any combination with potassium, calcium, and magnesium increased production consistently. K used alone tended to decrease yield. In most of the soils of southern Mississippi the cover crop makes but little growth unless fertilized liberally with P. Basic slag proved to be a good fer-

tilizer for the cover crop and was not harmful to the seed or to the inoculation on the seed. Many Mississippi growers apply the P and K to the cover crop and the N directly to the trees in early spring. Ammonium nitrate at the rate of 1 to 2 lb. per 6- to 8-year-old trees gave an outstanding response. Fruit from plots that received K contained 1.25 more percentage units of oil than that from plots where no K was applied. Nitrogen, although reducing slightly the percentage of oil, increased the size of nuts to such an extent that oil was actually increased. Tung nuts must be stored to permit them to become air-dry before milling.

The quality of flower and vegetable seeds on sale in New York in 1945, M. T. MUNN (*New York State Sta. Bul. 717 (1946), pp. 69*).—The results are presented of germination tests on a total of 2,400 samples of flower and vegetable seeds collected by the State Department of Agriculture and Markets. The flower seeds averaged rather low in quality, with 38 percent of the 426 samples too low in germination and another 11 percent practically worthless. The vegetables averaged better in quality, with over 90 percent labeled correctly as to germination and only 13.2 percent showing a specific label discrepancy or deficiency of some sort.

FORESTRY

Water and our forests, 'B. FRANK and C. A. BETTS (*U. S. Dept. Agr., Misc. Pub. 600 (1946), pp. 29+*, illus. 24).—This pamphlet discusses the vital role that water plays in the welfare of people; the damage resulting from excessive rains, melting snows, and drought; how soils, forests, and water are related; how forest covers help retain moisture, regulate stream flow, and reduce erosion; the need of protecting watersheds; and related topics.

Water and light in relation to pine reproduction, H. J. OOSTING and P. J. KRAMER (*Ecology, 27 (1946), No. 1, pp. 47-53, illus. 2*).—The more successful establishment of shortleaf pine at the margin of a forest than in the interior is attributed to better light conditions rather than to more favorable soil moisture. Measurements of soil moisture showed no more water available at the margins of the forest than within the stands. No environmental factor other than light was significantly more favorable at the forest margin than within the stand. The pines growing at the margin are in a favorable position with respect to photosynthesis, and can probably manufacture more food with which to develop extensive root systems which in turn can withstand drought better than trees within the forest.

Preliminary observations on northern white cedar in Maine, J. D. CURTIS. (Univ. Maine). (*Ecology, 27 (1946), No. 1, pp. 23-36, illus. 5*).—Northern white cedar occurs in both mixed and pure stands in soils ranging from a pH of 4.5 on uplands to a pH of 7.25 in swamps. The species reproduces by seed and vegetatively depending on the environment. Vegetative reproduction is common in the swamp and seed reproduction on upland soils. Seedling reproduction appears to be limited in the swamp sites due to fluctuations in the water table and to smothering by sphagnum moss. Evidence was obtained that white cedar is not as tolerant to limited light as believed commonly. This was indicated by a scarcity of advance reproduction, especially seedlings over 1 ft. in height, in all stands containing cedar. Among other factors limiting development of white cedar are snow, ice, deer, and porcupines.

Bibliography on cork oak, R. C. WATROUS and H. V. BARNES (*U. S. Dept. Agr., Bibliog. Bul. 7 (1946), pp. 66+*).—This bibliography includes refer-

ences to the literature on the cork oak and its culture; the stripping, treatment, and properties of cork; and the cork industry and trade of various countries. The cork of commerce is the outer bark stripped from the cork oak tree, *Quercus suber*, or its subspecies, *Q. suber occidentalis*. The cork oaks are native to the western Mediterranean region and probable successful culture elsewhere depends on the degree to which the climatic and other environmental requirements are met.

Ecuador's forests and the war, K. H. WYLIE (*U. S. Dept. Agr., Foreign Agr.*, 10 (1946), No. 5, pp. 75-80, illus. 2).—This is a description of the principal forest products in Ecuador (balsa, rubber, cinchona, tagua, kapok, tanning materials, and panama hats), especially as affected by the war and post-war conditions.

DISEASES OF PLANTS

[Abstracts of papers accepted for presentation at the thirty-seventh annual meeting of the American Phytopathological Society, St. Louis, Mo., March 27 to 30, 1946] (*Phytopathology*, 36 (1946), No. 5, pp. 394-413).—Abstracts of papers on the following subjects—many of them by State experiment station and U. S. Department of Agriculture workers—are included:

Cereal and forage crop diseases: Corn—pericarp injuries and seedling diseases, genetic variation in *Gibberella zeae* in relation to adaptation, inheritance of susceptibility to *Helminthosporium carbonum* race 1, prevalence of *H. turcicum*, *Angiospora zeae*, and *Phyllacora graminis* on corn in Guatemala, *Puccinia sorghi* on corn in Mexico, *Sclerospora* in dwarfing and witches' broom, differences in diploid lines of *Ustilago zeae*, adaptation of *U. zeae* lines to arsenic, and new inoculation method for *U. zeae*; teosinte—diseases in Mexico; barley—*helminthosporium* foot rot; milo—laboratory and greenhouse studies of "milo disease;" oats—new *helminthosporium* disease, varietal reactions to *Helminthosporium* n. sp., and a new race of *U. avenae*; rice—new race of *Cercospora oryzae*; wheat—bunt effect on seedling blight and foot rot, *Fusarium* head blight effect on bunt, leaf and stripe rusts in Mexico, and stem rust changes in Mexico; *Fusarium* spp. from cereal seeds in Canada; crop sequence effects on root rot in cereals and grasses; copper spot control on fine turf grasses, crown rust reactions of *Festuca elatior* and its variety *arundinacea*, and cytology of *U. striaeformis* from *Poa pratensis*; distribution and control of *Tilletia* spp. in Mexico; and viability of stored seeds of forage crops treated with different fungicides.

Truck crop diseases: Asparagus species and varieties—*Fusarium oxysporum* f. *asparagi* causing wilt and foot rot; bean—virosis in Montana; cabbage—varietal reactions to mosaic viruses and improvement of ascorbic acid content of yellows-resistant varieties; cucumber—anthracnose control with Fer-mate; spinach—virus inhibitors in extract; tomato—cuticle cracking in green fruits, cuttings wilted by toxic substance from *Phytophthora tumefaciens*, and Dithane control of *Fusarium* wilt; and watermelon—D-D mixture against nematodes permitting two crops per year for breeding work in Florida.

Potato and root crop diseases: Potato—spraying and dusting, organic and inorganic fungicides compared against late blight, pigment-pathogenicity correlation in *Actinomyces* of scab, polymodal dosage-response curve between Ca-K ratio and scab, soil nutrient effects on leaf roll symptom expression in the Green Mountain variety in greenhouse, and serological relationship of potato latent and virulent ring spot viruses; sweetpotato—fungicides compared as dips for "seed" roots.

Fruit crop and forest tree diseases: Apple—Mn toxicity in measles, *Glomerella cingulata* as affected by growth substances, chromogenic line of *G. cingulata*, inheritance of pathogenicity and sex reaction in *Venturia inaequalis*, and C and N nutrition and vitamins vs. growth of pathogenic and nonpathogenic lines of *V. inaequalis*; banana—soil actinomycetes in relation to Panama disease; citrus—fruit rot control and actinomycete wood necrosis and gummosis; stone fruits—ring spot virus contaminating virus cultures, sour cherry yellows vs. yields, temperature effects on symptom expression in sour cherry yellows and necrotic ring spot, virus wilt and decline of sour and sweet cherries, rusty mottlelike virus of sweet cherry, and interaction of peach mosaic virus forms; Pierce's disease—vector feeding method and tissues involved in transmitting virus in grape and alfalfa; black raspberry—mild streak disease; and forest tree diseases—cankers and rots of deciduous forests in Quebec; burn blight of jack and red pines following spittle insect injury; spread and control of chalara wilt of oaks; and tubercularia canker and dieback of *Ulmus pumila*.

Miscellaneous field crop diseases: Cotton—varietal reactions to bacterial blight, bacterial blight as affected by leaf development and inoculation method, and field tests with Dow 9 on cottonseed; soybean—pathogenicity of *Rhizoctonia solani* isolates, fungus brown stem rot, bacterial pustule controlled by dusting, and seed treatment, stand, and yield tests; sugar beet—seedling infection by fungi in Montana; tobacco—breeding for mosaic resistance, hybrids and varieties in relation to root rots, and mosaic transmission via dodder as influenced by shading.

General and miscellaneous: Outstanding diseases of agricultural crops and uses of fungicides in the United States, plant pathology in the U. S. Navy in wartime, water congestion and infection experiments on various plant species, some phenols as agricultural fungicides, Cu availability in dusts as influenced by diluents, physiology and pathogenicity of *Corticium solani* strains, *Phoma lingam* variability, nutrient needs of the antibiotic fungus *Streptomyces griseus*, and virus complex in *Eryngium aquaticum*.

The Plant Disease Reporter [April 15 and May 15, 1946] (*U. S. Dept. Agr., Plant Disease Rptr.*, 30 (1946), Nos. 4, pp. 93-128, illus. 5; 5, pp. 129-173, illus. 7).—The above issues contain the following:

No. 4.—Host-parasite check list revision—*Pisum* (*Leguminosae*), by F. Weiss; bean diseases in some of the Intermountain States in 1945, by W. J. Zaumeyer; winter injury of fall seeded wheat in Idaho, by E. C. Blodgett; fungi isolated from dormant grasses at Mandan, N. D., in January, by R. Sprague; cooperative flax seed treatment tests in 1945, by F. J. Greaney; diseases of vegetable crops during February in Palm Beach and Broward Counties, Florida, by G. R. Townsend, R. C. Cassell, E. L. Felix, and R. Desrosiers (Fla. Everglades Expt. Sta.); tobacco blue mold in Georgia, by J. G. Gaines; and some unusual disease occurrences, including *Phytophthora* isolated from Russian olive, by J. C. Carter, and *Phyllosticta hederas* on English ivy, by D. Gottlieb (both Ill. Nat. Hist. Survey) and a leaf blight of jack-bean in Cuba, by J. A. Stevenson.

No. 5.—Host-parasite check list revision—*Psoralea-Thermopsis* (*Leguminosae*), by F. Weiss; the sclerotinia rot disease of beans in Idaho (and experimental study with 11 literature references), by E. C. Blodgett (coop. Idaho Expt. Sta.); observations on some botrytis diseases in California, by K. F. Baker (Univ. Calif.); known distribution of phloem necrosis of the American elm, by T. W. Bretz and R. U. Swingle; report of the regional peanut seed treatment tests conducted in 1945, by S. B. Fenne (coop. Va. A. and M. Col.);

control of cucumber anthracnose with organic fungicides—a correction, by J. W. Heuberger (Del. Sta.); experimental forecast of wheat leaf rust in Oklahoma for 1946, by K. S. Chester and D. A. Preston (Okla. Sta.); wheat leaf rust in Texas, by I. M. Atkins (Tex. Sta.); diseases of vegetable crops during March in Palm Beach, Broward, and Martin Counties, Florida, by G. R. Townsend, R. C. Cassell, E. L. Felix, and R. Desrosiers (Fla. Everglades Sta.); and plant disease report Homestead area, Dade County, Florida, fall and winter season 1945–46, by H. I. Borders (Fla. Subtropical Sta.).

Index to Supplements 145-150, 1944 (U. S. Dept. Agr., Plant Disease Rptr., 1946, Sup. 151, pp. 483-550+).

An ascomycetous parasite of *Cephaleuros*, M. J. THIRUMALACHAR (*Indian Acad. Sci. Proc.*, 22 (1945), No. 6, Sect. B, pp. 374-377, illus. 4).—*Cephaleuros* spp. are well-known algal parasites on the leaves and tender shoots of many economic plants. *C. mycoidea* is regarded as a very superficial parasite, but *C. parasiticus* may become serious, since the filaments penetrate and spread within the mesophyll tissues. Both species have been collected on a large number of hosts in Mysore—the former, particularly, causing blemishes on guava fruits. In most of the author's collections of *C. parasiticus* the algal patches appeared to have been killed by an ascomycete; the entire patches were studded with fructifications of the fungus, which is identified as a species of *Strigula* and considered a true parasite of the alga. The relationships between the two and the possible use of the fungus for controlling this and similar parasites—such as the red rust of tea—are briefly discussed.

Differential isolation of *Chaetomium* spp. from mixed populations by hypochlorite solution, D. O. NORRIS (*Jour. Council Sci. and Indus. Res. [Australia]*, 18 (1945), No. 4, pp. 310-313, illus. 3).—Spores of this fungus genus are highly resistant to calcium hypochlorite solution, which is very effective against other organisms. Large numbers of spores of *C. globosum* survived immersion for 15 min., and an occasional spore may survive for up to 2 hr., in a solution containing approximately 2 percent chlorine. This differential sensitivity enables *Chaetomium* spp. to be isolated at will from mixed populations.

An undescribed species of *Elsinoë* from Mysore, M. T. THIRUMALACHAR (*Mycologia*, 38 (1946), No. 2, pp. 220-225, illus. 7).—*E. bitancourtiana* n. sp.—causing infection spots on living leaves of *Scutia myrtina*—is described and illustrated.

New and old fungicides for plant diseases, W. A. KREUTZER and R. E. ATKINSON (*Colo. Farm Bul. [Colorado Sta.]*, 8 (1946), No. 2, pp. 9-11, illus. 1).—Some of the newer chemicals are being tested by the station for seed and soil disinfection and as plant protectants; a brief outline of this work and its results is presented.

Reaction of dodders to stems of other dodders and to their own stems, C. F. LACKEY. (U. S. D. A.). (*Phytopathology*, 36 (1946), No. 5, pp. 386-388, illus. 1).—The two dodders, *Cuscuta subinclusa* and *C. californica*, commonly used in studying curly top and other virus diseases, were found able to grow parasitically on each and on their own stems as well as on other species of dodder. Their haustorial hyphae contact the vascular tissues of the dodder hosts without apparent harm to the tissues invaded.

Blights affect barley production, W. E. BRENTZEL (*North Dakota Sta. Bimo. Bul.*, 8 (1946), No. 4, pp. 27-29).—This brief report largely concerns blights originating from the seed, but also to some extent those coming from the soil. Data from 2 years' trials appear to indicate that the increased yields from Ceresan-treated seed were both from improved stands and from

prevention of root rots appearing after the seedling stage. The majority of the trials seem to support the practice of selecting heavy seed for sowing, and the application of a good seed disinfectant gave significant increases in yields for all trials during both years.

Powdery mildew of broad bean caused by *Erysiphe polygoni* DC. in Yunnan, China, T. F. YU (*Phytopathology*, 36 (1946), No. 5, pp. 370-373).—The author states in this first report of powdery mildew of broadbean in China that, although not of great economic importance, the disease attacks leaves, petioles, stems, and pods. In the northern bean-growing regions it appears late in the season on volunteer beans; in southern Yunnan it attacks the commercial crop. The occurrence of the disease has been correlated with air temperature, 20°-24° C. being optimum for development. The fungus overwinters as conidia or perithecia on beans, peas, or wild species of *Vicia*. Cross-inoculation tests with conidia from garden pea and 14 species of *Vicia* demonstrated that the fungus attacking both broadbean and pea in Yunnan is a distinct physiologic race, here designated *E. polygoni vicias pisi* n. f. This view is substantiated by the consistency of spore size and shape in conidia collected from the various hosts. Powdery mildew on *Lathyrus quinquenervius* is distinct from the powdery mildew of broadbean.

Clover rot, W. A. R. DILLON WESTON, A. R. LOVELESS, and R. E. TAYLOR (*Jour. Agr. Sci. [England]*, 36 (1946), No. 1, pp. 18-28+, illus. 5).—In addition to its wide distribution in America and western Europe, the clover sickness caused by *Sclerotinia trifoliorum* is reported to be of considerable importance in Britain. Most of the common legumes are subject to infection but vary in susceptibility; infected peas have not been observed in the field but succumb on artificial inoculation. On the basis of pathogenicity there appears no valid reason for according varietal rank to the bean strain of the fungus. Ascospores of either strain infect both clover and beans and react identically on each host; it is proposed, however, that the name *S. trifoliorum fabae* be retained until measurements have been made of the ascospores from widely separated localities. It is shown that apothecia may be produced from the sclerotia buried in the soil at depths down to 2 in., and that spore discharge from them may continue for 4 weeks. Ascospore infection, contamination of seed with sclerotia, and the distribution of sclerotia in stable manure or on soil adhering to implements are ways in which the disease may be spread. In an examination of 1,000 infected bean stems, sclerotia were found to a height of 15 in., but were most frequent between 2 and 7 in. It is estimated that if a 5-in. stubble is left, 93,000 sclerotia may be harvested with the haulms from a 10-acre crop having 1 percent infection; these may find their way into the manure if diseased haulms are used for litter. Sclerotia buried in manure in stockyards proved viable up to 3 mo., although they quickly lost viability when placed under wet conditions. Sclerotia in manure retained their viability longest when near the surface and least when buried more deeply. Losses may be reduced by avoiding too frequent cropping with susceptible hosts, by use of clean seed, and sometimes by allowing sheep to feed on over-luxuriant crops. To prevent spread of the sclerotia, it is suggested that where bean haulms or clover from an infected crop are employed for litter or feeding, they should be used first to insure incorporation into the lower layers of the manure in yards.

Relation of molds to the deterioration of corn in storage—a review, G. SEMENIUK and J. C. GILMAN. (Iowa Expt. Sta. coop. U. S. D. A.). (*Iowa Acad. Sci. Proc.*, 51 (1944), pp. 265-280).—"The present review [3 pages of references] attempts to assemble the published information on corn

in storage, with special reference to the role that micro-organisms, particularly the fungi, may assume in its deterioration." Observations and experimental data have shown that the water relations of corn—both the moisture content of the grain and the relative humidity of the air in which it is stored—are the principal factors in the problem of safe storage. The hygroscopicity of the corn contributes to the importance of the relative humidity and is in turn affected by the type of kernel. Temperatures are also involved—the higher increasing the speed of deterioration and the possibilities of spoilage and the lower favoring safe storage. The conditions under which deterioration occurs and the changes following its initiation indicate it to be primarily a biological decomposition. Examination of affected bins disclosed the presence of many fungi, among which *Penicillium*, *Aspergillus*, and *Rhizopus* predominated. The moisture requirements of these fungi are lower than for those ordinarily attacking corn in the field; although the latter group might be expected to be carried into storage, their moisture relations make them of minor significance in the corn storage problem. From the standpoint of practice, drying shelled corn to a point below that required for the growth of fungi—to an approximate 12-percent moisture content—and storing under conditions preventive of moisture condensation and its subsequent absorption are said to be the essential requisites of successful storage.

Seed treatment cheap insurance—pays off when germination is low, M. B. MOORE (*Minn. Farm and Home Sci. [Minnesota Sta.]*, 3 (1946), No. 2, p. 14, illus. 1).—Seed treatment tests on corn during the past 9 yr., using more than 60 different seed lots of standard hybrids, indicated an average increase of 3.7 bu. per acre; similar tests with other farm crops revealed smaller but still very attractive gains from treatment. By rather extensive laboratory tests it is possible to gain a fairly accurate idea as to whether a particular seed lot will be benefited by treatment. The percentage of fungus infection is many times a good indication of how badly a seed lot needs treatment, but since this is a laborious test the safest procedure is usually to treat all small grains and corn every year.

A contribution to the study of the physiology of galloping wilt in cotton, P. V. SABUROVA (*Compt. Rend. (Dok.) Acad. Sci. U. R. S. S., n. ser.*, 49 (1945), No. 1, pp. 69-72).—In the experiments reported, the amount of sap excreted by diseased plants was less than that from the healthy ones; the transpiration intensity between the diseased and healthy leaves was to the disadvantage of the former; no noticeable water deficiency was observed in the diseased plants. The physiology of the fungi causing galloping wilt or sclerotium root rot (*Sclerotium bataticola*) and "chronic wilt" or tracheomycosis (*Verticillium dahliae*) was studied. The parasitism of the former consisted in destruction of the living cortical tissues; the latter fungus lived in the xylem elements. In tests with aqueous extracts prepared from each of the fungi, a violent withering occurred in cotton branches placed therein. It is concluded that both diseases are associated with physiological disturbances in the plant and with the toxic effects of substances produced by the fungi.

Mosaics of winter oats induced by soil-borne viruses, H. H. MCKINNEY. (U. S. D. A.). (*Phytopathology*, 36 (1946), No. 5, pp. 359-369, illus. 4).—Mosaic diseases of winter oats occur in limited areas of the Carolinas, Georgia, and Alabama. Transmission to healthy seedlings was accomplished by wiping the leaves (carborundum powder method) with juices from the leaves and sheaths of mosaicked plants; manual transmission proved difficult. The viruses are carried over by some means in the soil; the optimum constant temperature for infection from this source is 65° F. Symptom expression is fa-

vored by 65°, which is satisfactory for manual transmission. Seed from diseased plants gave good germination and produced mosaic-free plants. The virus isolates studied are regarded as a new species. One isolate inducing spindle-shaped chlorotic markings (eye spots) is believed to be a variety of the predominating field type that causes broken or continuous chlorotic streaks—chiefly toward the apical region in younger leaves of the Letoria variety.

Leafspot of peanut associated with magnesium deficiency, R. W. BLEDSOE, H. C. HARRIS, and W. B. TISDALE. (Fla. Expt. Sta.). (*Plant Physiol.*, 21 (1946), No. 2, pp. 237-240, illus. 2).—Peanuts are susceptible to leafspot infection which becomes economically important during the last half of the growth period, when the crop is planted in spring; the severity and rapid spread in the field may not be due to the mere presence of the ubiquitous pathogen, but to the susceptibility of plants suffering from improper nutrition at certain growth stages. In the experiments reported, the plants were grown in sand cultures; in those with Mg deficiency, leaf spots were observed on those leaves which first showed symptoms of the nutritional disturbance and *Mycosphaerella arachidicola* was isolated from them. The progress of the disease followed the same order of development as that of the deficiency symptoms. Chemical analyses showed a decrease in Mg concentration from the basal to the terminal leaves, and spectrographic analyses substantiated these results. The prevalence of leafspot on plants grown under a deficiency of elements other than Mg was no greater than that of controls. In this study it thus appears that the low level of Mg was either directly or indirectly responsible for the susceptibility to leafspot.

Occurrence of *Bacillus polymyxa* (Praz.) Mig. in Alberta soils with special reference to its pathogenicity on potato tubers, A. W. JACKSON and A. W. HENRY (*Canad. Jour. Res.*, 24 (1946), No. 2, Sect. C, pp. 39-46, illus. 3).—This spore former was found widely distributed in Alberta soils. All isolates from the soil, together with several from other sources, proved capable of rotting potato tubers under high moisture and temperature conditions, when introduced through wounds. In these studies, pure cultures of *B. polymyxa* rotted potato slices at 20° to 45° C. and whole tubers at 30° to 45°, but caused no damage below the above minimum. Though it is probable that potato tubers and other vegetables developing in the soil often come into contact with this bacterium, they are unlikely to be rotted by it except when temperature and other factors are favorable. Field soil temperatures in Alberta are, in general, not conducive to decay of potatoes by this organism, but those near the soil surface may on occasion become favorable to its development. The fact that *B. polymyxa* can be isolated frequently from potatoes rotted in storage indicates that it is of some importance as a cause of decay in harvested tubers; if, however, recommended temperatures are maintained no damage from this organism should occur in storage.

Potato "bolters": An explanation based on photoperiodism, J. G. HAWKES (*Nature [London]*, 157 (1946), No. 3936, pp. 375-376).—The preliminary experiments reported, though insufficient for statistical analysis, "nevertheless give a very definite indication that the bolter condition is due to a genetical alteration of some nature, converting the plant from a long-day to a short-day type. Under short days the 'bolter' grows normally, but shows various 'wild' characteristics under long days, as with the short day, adapted *S[olanum] andigenum* when grown under the long summer days of temperate latitudes."

The relation of stomatal behavior at the time of inoculation to the severity of infection of soybeans by *Xanthomonas phaseoli* var. *sojense* (Hedges) (Starr) Burk., W. B. ALLINGTON and C. V. FEASTER. (U. S. D. A. and Mo. Expt.

Sta.). (*Phytopathology*, 36 (1946), No. 5, pp. 385-386, illus. 1).—Soybeans were inoculated with a suspension of *X. phaseoli sojense*—cause of the bacterial pustule of soybean. Inoculum was applied with a power sprayer maintaining about 150 lb. pressure and with the nozzle adjusted to deliver an unbroken stream of water until within a few inches of the leaves, where it broke up into large droplets similar to beating rain. Inoculations were made at 2-hr. intervals from 8 a. m. until 9 p. m., and each time the average width of the stomatal openings was determined. The amount of infection was found directly correlated with the width of the stomatal openings; both were greatest around midday. These findings should prove of considerable value in developing an improved technic for inducing artificial field epidemics of bacterial leaf spots for disease-resistance studies.

The separation and properties of tobacco mosaic virus in different states of aggregation, F. C. BAWDEN and N. W. PIRIE (*Brit. Jour. Expt. Pathol.*, 26 (1945), No. 5, pp. 294-312).—This study revealed that tobacco mosaic virus forms aggregates when exposed to the constituents of sap and to many other agents; a method is described for extracting the virus from infected leaves which greatly minimizes this aggregation. The virus in such extracts is inhomogeneous and can be separated by differential ultracentrifugation into fractions widely differing in properties. The most slowly sedimenting fractions contained much material other than virus nucleoprotein; the virus in these fractions exhibited no anisotropy of flow, behaved serologically like somatic antigens, and had only slight infectivity. The most rapidly sedimenting fractions, on the other hand, contained little except virus nucleoprotein, showed anisotropy of flow, and exhibited a serological behavior characteristic of flagellar antigens. In most fractions this change was accompanied by destruction of material other than virus nucleoprotein. The authors suggest that the primary virus particle is small and not greatly elongated, and that it occurs in the plant combined with extraneous materials, the removal of which sets free groups capable of combining with one another. Reasons for variations in the infectivity of different fractions are discussed, without definite conclusions. There are 31 references.

The ultracentrifugal examination of fractions of tobacco mosaic virus, J. P. JOHNSTON and A. G. OGSTON (*Brit. Jour. Expt. Pathol.*, 26 (1945), No. 5, pp. 313-315, illus. 1).—Using the "diagonal-schlieren" method of J. S. Philpot,² the authors examined 11 samples of preparations of tobacco mosaic virus in a Svedberg oil-turbine centrifuge, and the results are tabulated and discussed. The findings, in general, agreed with the rest of the evidence at hand on the nature of the virus fractions. None of the more slowly sedimenting components could be identified as containing the postulated primary virus; this is not considered surprising because of the possibility that the primary virus may be combined with nonspecific protein and in view of the amount of polydisperse material present in those fractions. It is notable that the fastest fraction appeared to be by far the most nearly monodisperse. The form of its boundary could not be used as a measure of the degree of polydispersity because of the distortion in the record, the lack of knowledge of the diffusion constant and of the variation in sedimentation constant with size for highly anisotropic particles, and because of the effect of variation in sedimentation constant with concentration. It is believed likely, however, that the range of particle sizes is not very great, and that if this fraction is formed by aggregation some factor limits the final degree or range of this aggregation fairly sharply.

²Nature [London], 141 (1938), No. 3563, p. 283.

Transmission of the mosaic virus of tobacco through larvae of *Plusia gamma* L., K. S. SUKHOV and A. M. VOYK (*Compt. Rend. (Dok.) Acad. Sci. U. R. S. S., n. ser., 49 (1945), No. 2, pp. 146-147*).—In the tests reported the larvae of *P. gamma* proved able to transmit the infection in a considerable number of cases.

Further studies on the purification and properties of a virus causing tobacco necrosis, F. C. BAWDEN and N. W. PIRIE (*Brit. Jour. Expt. Pathol., 26 (1945), No. 5, pp. 277-285, illus. 4*).—A nucleoprotein not present in healthy leaves was isolated from bean and tobacco leaves infected with the Rothamsted culture of tobacco necrosis virus. This has not crystallized when precipitated with salt, but it crystallized slowly from concentrated salt-free solutions or during sedimentation by ultracentrifugation; it had a sedimentation constant of 498—smaller than that of other plant virus preparations thus far studied. This strain readily loses its infectivity, and the relationship between the crystallizable protein and the virus remains uncertain. It is believed most likely that much of the protein is a noninfective derivative of the virus, having many physical, chemical, and serological properties in common with it.

Ultracentrifugal examination of a virus causing tobacco necrosis, A. G. OGSTON (*Brit. Jour. Expt. Pathol., 26 (1945), No. 5, pp. 286-287, illus. 1*).—A brief note on the findings from examination of three samples of tobacco necrosis virus in a Svedberg oil-turbine ultracentrifuge; the samples were the whole (preparative) ultracentrifuge pellet redissolved, the more rapidly dissolving fraction of a pellet, and the corresponding more slowly dissolving residue. Each preparation contained only a single visible component—apparently homogeneous—and the sedimentation constants failed to differ significantly. The ultracentrifuge revealed no difference between the fractions of the pellets exhibiting different rates of solution.

The etiology of take-all disease of wheat, I, II, N. H. WHITE (*Jour. Council Sci. and Indus. Res. [Austral.], 18 (1945), No. 4, pp. 318-335, illus. 5*).

I. *A survey of a take-all affected field at Canberra, A. C. T.* (pp. 318-328).—As part of a detailed survey of a take-all affected field, some preliminary observations are recorded beginning the first year of cropping to wheat after conversion from a savannah-woodland natural pasture and extending over 4 yr. Take-all plants occurred singly or in small groups throughout the field, but conspicuously in large irregular-shaped and well-defined areas. Soil from these and adjacent healthy areas failed to show significant differences in physical condition, organic C and N content, or reaction. Among random-sampled plants from both areas, 64 percent from the take-all areas and 7 percent from the healthy areas developed perithecia of *Ophiobolus graminis* on the culm bases; plantings from both lots yielded other fungi. From both lots the fungus species and the frequency of their occurrence were the same, including *Helminthosporium sativum* and *Fusarium culmorum*. During the first two seasons of cropping to wheat, the take-all patches were in the well-defined areas; in the succeeding years the diseased plants were widely distributed over the whole field. It was found that the location of these take-all areas shifted from season to season, although there was a tendency for them to be associated in succeeding years. Seedling blight symptoms in the field were associated with the presence of *O. graminis*. The distribution of plants exhibiting these symptoms was of a fundamental type of clustering, suggesting the operation of a locality factor; it is considered that this factor consists of foci of *O. graminis* inoculum. The evidence presented indicates that local

differences in soil condition other than those investigated and the location of the foci of inoculum may have been the factors determining the position of take-all patches in the field.

II. *Progressive necrosis and microfloral succession in root and crown tissue of wheat* (pp. 329-385).—During the development of a wheat crop spontaneously affected by take-all, there was an increase in the amount of diseased tissue, first in the seminal roots, then in the crown roots, and finally in the crowns of the wheat plants. There was also an increase in the number of plants with lesions as the crop developed, and at the ripe stage all plants had root lesions. The distinction between the condition of the roots of white-eared and normal-eared plants in this field was one of degree only. The lesions were caused by a primary invading organism—*O. graminis*. In the tissue lesions of the roots and crowns, there was a microfloral succession which resulted in the disappearance of *O. graminis*. Organisms isolated from the basal tissues of wheat plants with take-all symptoms may not have a true causal relation to the disease, but instead represent the dominants of a climax fungus community found in senescent root tissues. There are 24 references to the two parts.

Yellow berry and stem rust of wheat, G. MINZ (*Phytopathology*, 36 (1946), No. 5, pp. 381-383).—According to studies in Palestine, Florence wheat rust when controlled by sulfur dusts revealed an average reduction from 24 to 0.2 percent yellow spots in the kernels. An etiological connection between yellow berry and stem rust of wheat may be assumed; thus control of the rust is simultaneously effective against yellow berry.

The effect of DDT on the stem rust reaction of Khapli wheat, T. JOHNSON (*Canad. Jour. Res.*, 24 (1946), No. 2, Sect. C, pp. 23-25, illus. 1).—Seedling leaves of this wheat—a variety highly resistant to the physiologic races of *Puccinia graminis tritici* prevalent in North America—became susceptible a few days after spraying with DDT (1 oz. to 5 gal. water). This response proved highly specific, since only one other of the resistant wheats tested (Arnautka) exhibited any indication of susceptibility consequent on such spraying. Specificity of response was also indicated by the development of marked chlorosis on leaves of some varieties, whereas others remained unaffected.

Effect of storage on treated seed wheat, W. CROSIER. (N. Y. State Expt. Sta.). (*Farm Res. [New York State and Cornell Stas.]*, 12 (1946), No. 2, pp. 4, 10).—New Improved Ceresan at only 0.5 oz. per bushel of wheat seed is reported to eliminate smut and to control seedling blights; even smaller dosages controlled smut when the treated seed was stored for about a week. The effectiveness of this material depends on its volatility; thus if stored for prolonged periods the seed should be held in sacks in an open granary so that the excess gas may escape without injury to the seed. Treated seed planted within a week usually produced 2 to 3 bu. more than the untreated, even with smut absent; when bunt spores are present, the treatment often increases the yield by 10 to 15 bu. per acre.

Physiologic races of *Puccinia graminis tritici* in Canada, 1919 to 1944, M. NEWTON and T. JOHNSON (*Canad. Jour. Res.*, 24 (1946), No. 2, Sect. C, pp. 26-33, illus. 1).—During 1919-44, 65 races were identified from a total of 4,543 isolates derived from uredial collections; 49 races were obtained from the Prairie Provinces (3,475 isolates), 40 in eastern Canada (1,013 isolates), and 12 in British Columbia (55 isolates). During this period the predominant races exhibited notable fluctuations in prevalence. Races 36, 17, and 21 were the most common until shortly after 1930 and were largely

responsible for the severest rust losses in Marquis and other common wheats during the preceding decade. Races 34 and 49 were frequently collected from 1927 to about 1935. All these races diminished in prevalence during 1930-36, whereas race 56—first collected in Canada in 1931—has become the predominant race since 1934; it was this race which played a major role in the epidemic of 1935. Another recent change was a recrudescence in 1940 of race 17, which for several years had been of minor importance; in 1941 this race challenged the preeminent position of race 56 but receded again in the following years to a minor position.

The distribution of races is somewhat similar but not identical in different parts of Canada. Races 36 and 21 have been relatively more common in the Prairie Provinces than in eastern Canada; the contrary is true of race 38. Only about 12 of the 65 races have thus far assumed much economic importance; a few others may be considered of minor significance, but at least two-thirds of the races have been found only occasionally and have—for reasons not fully understood—failed to gain even limited distribution. Comparison of the number of physiologic races collected in eastern Canada vs. the Prairie Provinces has indicated a somewhat greater variety in the former area, a condition possibly explainable by the presence of the common barberry in many localities of eastern Canada. There are 22 references.

Infection studies with *Actinomyces scabies*, W. J. HOOKER and G. C. KENT. (Iowa Expt. Sta.). (*Phytopathology*, 36 (1946), No. 5, pp. 388-389).—This brief account of work in progress reports stunting, root necrosis, and premature death of seedlings of radish and other vegetables grown in sterilized peat soil artificially infested with cultures of the potato scab organism, *A. scabies*. Spore suspensions applied to wounded potato foliage induced localized necrosis.

Fungicidal control of cantaloupe powdery mildew, J. T. MIDDLETON and C. E. YARWOOD (*California Sta. Bul.* 697 (1946), pp. 8, illus. 4).—As based on experimental control of *Erysiphe cichoracearum*, a first spray should be applied when one to five mildew spots per leaf are found on the lower surfaces of the crown leaves. For early-planted cantaloups a second application should follow when mildew again increases to the same degree of severity; usually, however, only one treatment is necessary for the medium and late crops. With temperatures below 95° F., 38 oz. liquid lime-sulfur (0.3 gal.) plus 6 oz. B-1956 per 100 gal. water is said to be the most economical mixture and one of the most effective sprays used; above 95° it is injurious, and 1.5-2-100 burgundy or 1.5-100 Cuprocide plus spreader may be recommended. The highest yield increase in the experimental work was secured on early cantaloups receiving an early spray of liquid lime-sulfur, followed 2 weeks later by Cuprocide.

Relative susceptibility of carrot varieties to nematode damage, yellows, and defoliation by blights, J. D. WILSON (*Ohio Sta. Bimo. Bul.* 239 (1946), pp. 35-39, illus. 2).—Nematodes, yellows, and leaf blights are said to make it increasingly difficult to grow carrots on the muck lands of Ohio; 35 varieties were compared at McGuffey (1945) for resistance to damage by these diseases. Little resistance to nematode infestation and damage was encountered, though some varieties were more severely affected than others. Both long- and short-root types were deformed, but there was some indication that the short-rooted forcing types are least able to develop marketable roots following nematode injury to the growing point of the root. All varieties were susceptible to yellows, though some exhibited a considerably higher percentage than others. Streamliner, Amsterdam Forcing, St. Vallery, Short Top

Shipper, and Improved Short White were all over 10 percent diseased; others, like Luc and Coreless Chantenay, were below 8 percent. There was a wide variation in susceptibility to defoliation by leaf blights. Some of this may have been due to the fact that the disease failed to become serious until late in the season, when the tops of many of the early-maturing varieties had already started to die from natural causes. Varieties such as Chantenay, Redheart, Hutchinson, French Market, and the Belgian stock carrots were least attacked; those most susceptible included French Forcing, Nantes Half Long, Touchon, and Table Queen, among others.

Diplodia rot of onions. G. B. RAMSEY, B. C. HEIBERG, and J. S. WIAINT. (U. S. D. A.). (*Phytopathology*, 36 (1946), No. 4, pp. 245-251, *illus.* 3).—A market disease of Texas-grown Crystal Wax onions caused by *Diplodia natalensis* is here described for the first time; colored-skin varieties from Texas were not affected. Only the dead outer scales and the dying parts of the outer fleshy scales were invaded. A chemical (probably protocatechuic acid) associated with the pigments in aqueous extracts of the dry outer scales of colored varieties proved toxic to the spores of this fungus, but the dry scales of white onions do not carry this toxic agent in sufficient amounts to interfere with spore germination. Determination of the pH of both the dry outer and the fleshy scales of white and colored varieties revealed that the acidity of these tissues is not the primary factor in limiting the pathogenicity of the *Diplodia* to white varieties. Although the fungus is not strongly pathogenic to onions, it may cause a great reduction in market value by producing slight decay and by blemishing the southern white onion crop.

Dust fungicides versus formaldehyde in the control of onion smut. R. NELSON (*Michigan Sta. Quant. Bul.*, 28 (1946), No. 3, pp. 226-247, *illus.* 4).—Smut (*Urocystis cepulae*) is one of the major diseases of the seeded onion crop in Michigan, occurring in most of the important onion districts and with constantly increasing range. The standard method of prevention consists in applying a dilute formaldehyde solution in the row with the seed; though very effective, it is objectionable because of the time and labor involved. In three season trials of dust fungicides, they were either mixed in the drill with the seed or stuck to it with special binding materials; those containing tetramethyl thiuramdisulfide (Arasan, Thiosan) were tested at ratios of 1-1, 1-4, 1-8, and 1-25. The evidence, while inconclusive, indicates that dusts are neither equal nor superior in effectiveness to the standard method under moderate to heavy soil infestation with the smut fungus. In some commercial plantings where soil infestation was light they gave adequate control. In small-scale trials Arasan (1 lb. to 4 lb. seed) gave satisfactory control in the heavy seedings for set production. Until additional tests are completed Michigan farmers are urged to try the dust treatment only experimentally and to use formaldehyde for the main plantings.

Late blight of tomatoes in east Texas at transplanting time. P. A. YOUNG. (Tex. Expt. Sta.). (*Phytopathology*, 36 (1946), No. 5, pp. 389-391, *illus.* 1).—Tomato plants 6 to 12 in. tall brought from the Lower Rio Grande Valley of Texas in March 1945 were set out in fields near Jacksonville, where most of them died of late blight (*Phytophthora infestans*).—This parasite spread into nearby hot beds and cold frames, killing the tomato seedlings in them. The imported plants developed light brown stem cankers—the stems becoming constricted, twisted, and broken at such points. Nearly all of the leaves and most of the stems were killed in the cold frame. Some infected plants survived until warm weather and developed new tops. This is apparently the first time that late blight has been reported in east Texas and indicates that it was introduced in the diseased plants.

Certain aspects of the epiphytology and control of tomato fruit rot caused by *Phytophthora capsici* Leonian, W. A. KREUTZER and L. R. BRYANT. (Colo. Expt. Sta.). (*Phytopathology*, 36 (1946), No. 5, pp. 329-339, illus. 1).—*P. capsici* isolates from rotting tomatoes developed sporangia abundantly within 48 hr. at 25° C. when 20- to 60-day-old giant cultures were ground and mixed with well-moistened nonsteamed field soil. Sporangia developed readily at 20° to 30°, but none was produced at 18° or below or at 35°. Though abundant moisture is essential, the prime requisite for an epidemic is a soil temperature between 18.3° and 29.4°. When water was added to soil inoculum that had been held at 25° for 48 hr., swarm spore production reached its peak in 2 to 3 hr. at 25°. Earliest infection of noninjured green or ripe tomato fruits occurred after a 60-min. exposure to drops of inoculum containing swarm spores at 25° and 30°. Infection reached its peak after a 180-min. exposure at 25° and 30°. Exposure of fruits to swarm spores at 10° for 5 hr. resulted in infection. Studies of swarm spore activity showed that the time required to produce infection is correlated with the time required for swarm spore germination. Tests on culture practices for control of fruit rot revealed that mulching with straw or staking results in more healthy fruit than the corresponding controls (1 percent level of significance). Ridging produced significantly more healthy fruit than the controls (5 percent level of significance). In trials with fungicidal dusts on fruits in contact with the ground, 5 and 10 percent cuprous oxide and 10 percent copper oxychloride gave highly significant control; bordeaux spray (4-4-50) also effectively controlled the disease. Preliminary studies on the addition of CuSO₄ to irrigation water at the time of soil inoculation indicated a highly significant degree of control. Of 120 commercial varieties, lines, and types of tomatoes tested in the field, a few lines have shown some slight promise of resistance.

"Flue dust" as an agent in the production of sun scald on tomato seedlings, R. MCKAY ([Ireland] *Eire Dept. Agr. Jour.*, 42 (1945), No. 2, pp. 233-235, illus. 4).—For a number of years some growers had been mixing the flue dust from cement factories with the dark compost used for raising tomato seedlings. The "sunscald" injury experienced was suspected of having a relation to this material. Later, the injury was experimentally reproduced several times in September 1944, and again in March 1945, by mixing the flue dust with the compost or by adding a layer to the surface in the seed boxes, followed by exposure to direct sunlight. Control plants raised in the same compost without the flue dust and kept under the same conditions were unaffected, as also were seedlings raised in compost plus flue dust but kept in the shade or continually moist. The worst sunscald occurred when the surface layer in the boxes to which flue dust had been added was allowed to dry out and form a crust. It is well known that dark soils readily absorb the sun's rays, and when a crust forms it acts as a better conductor of heat to the plants.

Temperature effects on the expression of the yellows virus in sour cherries, W. D. MILLS. (Cornell Univ.). (*Phytopathology*, 36 (1946), No. 5, pp. 353-358).—Statistical examination of data on the severity of the virus yellows of Montmorency cherries during the past 25 yr. revealed that the chief factor in determining yellows expression in the orchard for any one year is the prevailing temperature for 30 days after petal fall. The symptoms are more severe in seasons of early bloom because of the lower temperatures normally following it. Factors not influencing the degree of orchard symptoms in any one season are the prevailing temperatures after the symptoms

first appear, the incidence of cherry leaf spot, and the amount of precipitation. Since prevailing temperatures following bloom cause a high variation in the apparent amount of yellows present from year to year, no information as yet in hand can either prove or disprove any spread of the virus after the trees are set in the orchard.

Physiologic races of yellow rust of raspberries in western Washington, F. JOHNSON. (Wash. and West. Wash. Expt. Stas.).' (*Phytopathology*, 36 (1946), No. 5, pp. 383-384, illus. 1).—Inoculations indicated that there are two physiologic races of yellow rust (*Phragmidium rubi-idaei*) infecting red raspberries in western Washington. The one from Whatcom County—adjacent to Canada—infected both Cuthbert and Washington varieties equally well. On the other hand, the latter variety proved resistant to infection by the race collected from Cuthbert and Marlboro raspberries grown in the Puyallup Valley. No rust has been found in Whatcom County on the Lloyd George or Newburgh varieties grown in close proximity to infected Washington plants; the Tahoma variety was apparently immune to both races.

Mineral nutrient deficiencies in California citrus trees and their causes.—II, Relation of each element to citrus, P. W. ROHRBAUGH (*Calif. Citrog.*, 31 (1946), No. 7, pp. 250, 258-260).—In this part (E. S. R., 95, p. 217) the relations to citrus of Ca, Mg, K, P, N, B, Fe, Mn, Zn, and Cu are taken up. It is said to be evident from field observations that at least occasional deficiencies in N, Fe, Zn, Mn, and Cu are not uncommon on citrus in southern California, and it is believed possible that there are some deficiencies in K and P. It is also believed quite evident that the deficiency problem—aside from N—is largely one of unavailability rather than of absence from the soil; the factors behind such conditions are briefly discussed.

Gray mold studies, L. J. KLOTZ, E. C. CALAVAN, and G. A. ZENTMYER (*Citrus Leaves*, 26 (1946), No. 5, pp. 6-7, 14, illus. 4).—Because of its alleged role in decreasing the set of young lemons and thus reducing the yields the gray mold fungus, *Botrytis cinerea*, has demanded renewed attention and study. This is a brief discussion of present knowledge on injuries caused by it and experiments under way for its control.

A progress report on quick decline studies. (Calif. Citrus Expt. Sta.). (*Calif. Citrog.*, 31 (1946), No. 6, pp. 198-199, 207, 210-215, illus. 1).—The purpose of this report is to show the status of investigations on quick decline of orange trees according to the facts—both positive and negative—accumulated by the workers whose discussions appear under the following headings: Starch Relationships, by H. S. Fawcett; Histological Studies, by H. Schneider; The Effect of "Quick Decline" on the Respiration Rate, by P. W. Rohrbach, L. J. Klotz, and G. A. Zentmyer; Experiments on the Possible Fungal, Bacterial, and Other Biological Relationships of Quick Decline, by L. J. Klotz and G. A. Zentmyer; Root Decay of Trees Affected With Quick Decline, by J. M. Wallace and G. A. Zentmyer; and Transmission Experiments With Diseased Tissues, by H. S. Fawcett and J. M. Wallace.

Quick decline studies. (Calif. Citrus Expt. Sta.). (*Citrus Leaves*, 26 (1946), No. 4, pp. 6-9, 16, 22, 28, 38-40, illus. 3).—See preceding entry.

The rootstock factor in quick decline, K. M. SMOYER and F. F. HALMA. (Univ. Calif. et al.). (*Calif. Citrog.*, 31 (1946), No. 7, pp. 249, 252, illus. 2).—In a 2-yr. survey, only navel and Valencia oranges on sour stock were found affected with quick decline. It is believed that sweet orange, probably grapefruit, and possibly trifoliata and rough lemon are either highly resistant or immune. Definite symptoms were encountered only on trees 3 or more years old. No regular pattern of spread was observed, and the rate within

and between orchards was not consistent. Some evidence was found that Eureka lemon is not susceptible. No Marsh grapefruit orchards were located in the affected area under study.

Quick decline studies, F. F. HALMA and K. M. SMOYER (*Citrus Leaves*, 26 (1946), No. 5, pp. 8-9, 33, illus. 2).—See preceding entry.

Notas sobre la podredumbre de las raicillas o "tristeza" de los naranjos [Notes on root rot or "tristeza" of orange trees], G. L. FAWCETT (*Rev. Indus. y Agr. Tucumán*, 35 (1945), No. 1-3, pp. 33-35).

Botrytis mold in lemons in Ventura County, C. C. DELPHEY (*Citrus Leaves*, 26 (1946), No. 5, p. 7).—A brief note on a field test in which Bordeaux (8-3-100) gave promising results.

The effect of botrytis rot on lemons, L. J. KLOTZ, E. C. CALAVAN, and G. A. ZENTMYER. (Calif. Citrus Expt. Sta.). (*Calif. Citrog.*, 31 (1946), No. 7, pp. 247, 262, illus. 5).—A summary of an address reporting the effect of botrytis rot on lemons in orchard and packing house.

Camellia flower blight, H. EARL THOMAS and H. N. HANSEN. (Univ. Calif.). (*Phytopathology*, 36 (1946), No. 5, pp. 380-381).—Sclerotia of the causal fungus *Sclerotinia camelliae*, which had been placed in soil under lath in 1943, produced apothecia in 1944, 1945, and 1946.

The eradicant action of a fungicide on *Colletotrichum lilii* in lily bulbs, F. J. LEBEAU. (La. Expt. Sta.). (*Phytopathology*, 36 (1946), No. 5, pp. 391-393, illus. 1).—Puratized N5X and its improved form Puratized N5E (10 percent phenyl mercuri triethanol ammonium lactate) were effective in eradicating *C. lilii*—cause of black scale of Easter lily—when the bulbs were immersed in aqueous solutions of these materials. The effective concentration ranged from 1-250 to 1-4,000; 24-hr. treatments proved sufficient for all but the highest dilution, for which 48 hr. appeared necessary. Control was poor with treatment times of less than 24 hr., regardless of concentration; no injury occurred except at 1-500 or higher concentrations.

Perithecia of powdery mildew on zinnia seed, K. F. BAKER and W. F. LOCKE. (Univ. Calif.). (*Phytopathology*, 36 (1946), No. 5, pp. 379-380).—Perithecia of *Erysiphe cichoracearum* developed on zinnia seed in the field, following vegetative development of the fungus in the flower heads. Although perithecia were still present on 2.31 percent of the seed after threshing and cleaning and on some seed coats after they had pushed through the soil in germination, there were no infections of the seedlings. Sulfur dusts should be applied prior to the time of flower infections for mildew control in seed fields.

Modifications de la morphologie et de l'économie hydrique des feuilles de *Fagus silvatica* par l'action d'une période de gel au cours de la feuillaison [Modifications in the morphology and water economy of the leaves of European beech caused by a period of frost during foliation], G. LEMÉE, (*Compt. Rend. Acad. Sci. [Paris]*, 222 (1946), No. 8, pp. 451-453).

Alcoholic fermentation of carbohydrates and dehydrogenation of alcohols by certain wood-destroying fungi, F. F. NORD, L. J. SCIARINI, J. C. VITUCCI, and E. S. PALLARES (*Nature [London]*, 157 (1946), No. 3985, pp. 335-336).—The results recorded in this preliminary report further substantiate the presence of a dehydrogenating enzyme system in the four wood-destroying fungi (*Merulius* spp. and *Fomes annosus*) used.

New species of *Poria*, L. O. OVERHOLTS and J. L. LOWE. (Pa. Expt. Sta. et al.). (*Mycologia*, 38 (1946), No. 2, pp. 202-212, illus. 2).—In the course of independent studies of miscellaneous collections of fungi of this genus of the Polyporaceae and the timber rots caused by them, the authors found seven apparently undescribed species which are here described as new.

Host-parasite relationships of the root-knot nematode *Heterodera marioni*.—II, Some effects of the host on the parasite, J. R. CHRISTIE (U. S. D. A.). (*Phytopathology*, 36 (1946), No. 5, pp. 340-352, illus. 3).—In continuation of this series (E. S. R., 92, p. 230) it was found that some plants are highly suitable hosts for *H. marioni* and others are highly unsuitable; most plants, however, lie between these extremes, representing various intermediate degrees of suitability. Unsuitability as a host is manifested through retarded development of the parasite. A series of controlled experiments demonstrated that the rate of parasite development may differ (1) when different plants serve as hosts for the same race of parasite or (2) when the same plant serves as host for different races of the parasite. When the plant is a slightly unsuitable host and parasite development is but slightly retarded, the effect may be little more than to reduce the number of generations in a given period. When the plant is a moderately unsuitable host and parasite development is more strongly retarded, many of the ♀ nematodes never reach maturity and there may be a reduction in the egg output of those that do. When the plant is a highly unsuitable host, parasite development is almost completely suppressed and eggs are not produced. Unsuitability of the plant to serve as host is not necessarily accompanied by a corresponding reduction in the severity of gall formation.

ECONOMIC ZOOLOGY—ENTOMOLOGY

Notes on recent opinions of the International Commission on Zoological Nomenclature, C. W. SABROSKY (*Ent. News*, 57 (1946), No. 1, pp. 14-16).

Studies on deciduous forest animal populations during a two-year period with differences in rainfall, L. A. RICE (*Amer. Midland Nat.*, 35 (1946), No. 1, pp. 153-171, illus. 5).—The purpose of this paper is to report on several aspects of forest animal populations in the William Trelease Woods of the University of Illinois—a 50-acre woodland tract near Urbana. Sweeping a definite area revealed that 50 strokes would give an average sample of inhabitants of that area but would not take all individuals on the area. The population of resident species inhabiting the herbs and shrubs was larger in 1934 than in 1935; the overwintering population of these species was much larger in the spring of 1934 than in that of 1935. The population of certain herb-inhabiting species declined during the summer of 1934, in which rainfall was below normal in May; the population increased toward the end of the summer of 1935, in which rainfall was much above normal in May and slightly so in June-July. The winter and migrant populations of birds ranged from 400 to 600 and were over 70 percent insectivorous. In 1935 robins took five-sixths of the hibernating invertebrates in an area of 25 acres. The largest number of migrating birds came through when the insect population was moving in and out of the woods for hibernation. Though the population of invertebrates available to birds is probably 20 times that consumed by them—including their young—the pressure falls on the Lepidoptera, Diptera, Hymenoptera (sawflies, etc.), and large palatable Hemiptera, while the small leafhoppers and flea beetles are utilized to a small extent. The species with large individuals are rarely abundant in the woods.

Vertebrate inhabitants of the piñon association in the Death Valley region, A. H. MILLER. (Univ. Calif.). (*Ecology*, 27 (1946), No. 1, pp. 54-60).—“In the Grapevine Mountains, immediately east of Death Valley, the piñon belt extends from 6,000 to 8,700 ft. In addition to normal piñon woodland, there has developed locally a forest of piñons, an unusual climax stand, which

has provided 'life-forms' for one group of vertebrates that otherwise would be absent in the breeding season. In the upper levels of the mountains there is a temperature zone comparable to that of the Transition Life Zone elsewhere into which the piñons have spread from the Upper Sonoran Zone. The moderately cool summer temperatures of the higher levels make possible the establishment of another group of species not customarily associated with the piñons. In analyzing these departures from the normal composition of the piñon-juniper community, one inevitably reverts to stressing requirements of individual species, particularly when it is seen how variously the species respond to the factors which have been conceived of as circumscribing the concepts of life zone and biome." Lists of summer resident and transient and vagrant birds and of mammals are included.

Study of the Alaska tundra with reference to its reactions to reindeer and other grazing, L. J. PALMER and C. H. ROUSE (*U. S. Dept. Int., Fish and Wildlife Serv., Res. Rpt. 10 (1945), pp. 48+, illus. 20*).—The Alaska tundra varies in width from a few miles to 200 miles along the Bering Sea and from 100 to 150 miles along the Arctic coast. Plant composition consists largely of lichens, grasses, sedges, alpine, and shrubs, 16 distinct vegetative types of which are described in this report. Studies were begun in 1920 to work out the principal range and range requirements of the reindeer. Subsequent disturbance by grazing and fire—accompanied by climatic changes—has resulted in general confusion in plant mixture and occupation. Recovery of the lichen range—injured by grazing or fire—may require 20 to 40 yr. for restoration of the original density and height. Reestablishment of vascular plants is rapid. Moderate grazing by open herding and rotational use should permit sustained utilization of undamaged tundra.

The pocket gopher in relation to soil erosion on mountain range, L. ELLISON. (*U. S. D. A. (Ecology, 27 (1946), No. 2, pp. 101-114, illus. 6*).—In what is considered a representative part of the subalpine zone of the Wasatch Plateau in Utah, annual displacement of soil to the surface by pocket gophers was found in 1941 to be at least 5 tons per acre and to cover 3.5 percent of the surface; their base population is estimated to be around 4 to 16 individuals per acre. The gopher diggings tend to be cast out on bare spaces between masses of vegetation where, as a result of grazing, the loose soil is most exposed; the diggings also tend to be concentrated in gullies where the soil is readily swept away. Both these effects are pronounced in proportion as the range is depleted. The tendency for the pocket gopher to displace soil consistently downhill is one factor in normal erosion creep; its magnitude is abnormally increased in proportion as protective vegetation is absent. No evidence was found in this area that their tunnels concentrate overland flow in a degree to create gullies unless, possibly, abnormal superficial runoff is induced by other causes. Delayed infiltration—cause of gully-cutting runoff—cannot be attributed to gopher activities; on the contrary, loosening of the soil and formation of minor irregularities on the surface by pocket gophers are believed to increase the rapidity of infiltration. No evidence was found on the area that gophers destroy vegetation sufficiently to cause accelerated erosion; their diggings provide a surface for establishing vegetation that is less favorable than an undisturbed soil surface with a plant cover, but apparently more so than a severely eroded surface. The gophers seem to be instrumental in the revegetation of some erosion-pavement areas. It is concluded that the pocket gopher is an agent in both geologic-normal and accelerated erosion; it is not, however, the primary cause of accelerated erosion on the Wasatch Plateau; there, the primary cause is over-

grazing. The amount of accelerated soil resulting from the gopher activity is related to the degree in which the soil mantle is dissected and the soil surface bared by man's abuse of land.

A supplementary note on the winter food habits of cottontail rabbits, H. L. SWEETMAN. (Mass. State Col.). (*Ecology*, 27 (1946), No. 2, pp. 185-188).—Additional information (E. S. R., 92 p. 676) is presented on the selectivity of woody plants as food for the cottontail rabbit on a site having 101 species, which are tabulated and discussed.

Mammals and plague distribution in the United States, W. H. LAENUM (*U. S. Naval Med. Bul.*, 46 (1946). No. 5, pp. 782-785).—Native rodents, as hosts of bubonic plague, are said to possess a place of prime importance in spreading this disease in the United States. The distribution of human and rodent plague as here presented is a compilation from many sources intended as an aid to personnel engaged in rodent control work.

Comparative assays of rodenticides on wild Norway rats.—I, Toxicity, S. H. DIEKE and C. P. RICHTER (*Pub. Health Rpts. [U. S.]*, 61 (1946), No. 19, pp. 672-679, illus. 2).—Using 406 recently trapped adult wild Norway rats, the authors bioassayed 8 rodenticides. The various poisons suspended or dissolved in 10 percent acacia solution were administered to unanesthetized rats through a metal stomach tube. No significant seasonal variation was observed, nor was there any difference in results between the sexes except with red squill. The median lethal doses and their standard errors were found to be as follows in milligrams per kilogram body weight: 1080 (sodium fluoroacetate), 0.22 ± 0.01 ; strychnine sulfate, 4.8 ± 0.4 ; ANTU (alpha-naphthyl thiourea), 6.9 ± 0.5 ; thallium sulfate, 15.8 ± 0.9 ; zinc phosphide, 40.5 ± 2.9 ; arsenic trioxide, 138 ± 13 , fortified red squill—♀♀ 133 ± 10 , ♂♂ 276 ± 29 ; and barium carbonate, $1,480 \pm 340$.

Instructions for using ANTU as a poison for the common Norway rat, C. P. RICHTER and J. T. EMLEN, JR. (*Pub. Health Rpts. [U. S.]*, 61 (1946), No. 17, pp. 602-607).—This paper considers rat control as a community problem, and presents instructions on how, where, and when to use this specific poison (alpha-naphthylthiourea), how to prepare it for use, how to check results, precautions to be observed, and how to treat accidental poisoning.

Du Pont "Antu" Rodenticide (alphanaphthylthiourea), E. H. RIEMAN (*Pests*, 14 (1946), No. 3, pp. 28, 30).—A general statement on this rodenticide, including directions for use.

Nesting heights of birds building in shrubs, F. W. PRESTON (*Ecology*, 27, (1946), No. 1, pp. 87-91, illus. 6).—The vertical distribution of nests of the Brewer blackbird—as reported by La Rivers (E. S. R., 93, p. 54)—and of the catbird and American robin—as observed at Butler, Pa.—approximates to a simple Gaussian distribution if height is plotted logarithmically. This, the author states, is to be expected if the bird has a "favorite" nesting height above ground level, is "conscious" of the ground as a controlling factor in choosing the site, but has only a very confused notion of the "art" of measuring the height.

Calculation of fish condition from scale dimensions in the bluegill (*Lepomis macrochirus*), H. B. CHASE. (Ill. Nat. Hist. Survey and Univ. Ill.). (*Ecology*, 27 (1946), No. 2, pp. 182-184).—A method of estimating weight and thereby condition at previous times by means of the scale record was devised for the bluegill, and formulas based on the findings from the study are presented.

Variations in abundance of certain invertebrates in William Trelease Woods, 1933-1938, S. E. JONES (*Amer. Midland Nat.*, 35 (1946), No. 1, pp.

172-192, illus. 4).—In this University of Illinois woodland during 1933-38 the abundance of various invertebrates has varied sharply. Not all the species in one locality respond in the same way to weather conditions; one set of conditions affects the various species differently. Following the severe winter of 1935-36 some species increased and some decreased in abundance. During hot dry seasons the majority of invertebrates in an elm-maple forest were less abundant than in moderately warm humid seasons. In the warm damp spring of 1938 most invertebrates emerged from hibernation earlier than in the cold spring of 1937. The time at which animals begin or end hibernation can be determined only by frequent collections made during the period of migration into or out of hibernation. The causes of many common phenomena in invertebrate populations will be better understood if a community study is continued over a period much longer than 5 yr. Weather conditions cannot explain all the variations in invertebrate populations; other factors must exert at least a slight effect.

On some centipedes from Georgia, R. V. CHAMBERLIN (*Canad. Ent.*, 77 (1945), No. 11, pp. 215-216).—Among the chilopods listed are descriptions of one new species each of *Neolithobius* (with key) and *Eulithobius*.

A poison-squirting spider, E. R. TINKHAM ([U. S.] *Off. Surg. Gen., U. S. Army Med. Dept. Bul.*, 5 (1946), No. 3, pp. 361-362).—Note on a spider identified as *Peuceetia viridans*.

Season of attachment and growth of sedentary marine organisms at Lamoine, Maine, J. L. FULLER. (Univ. Maine). (*Ecology*, 27 (1946), No. 2, pp. 150-158).—Initiation of this study was stimulated by the problem of fouling of ships, buoys, and other immersed objects; aside from such practical applications, these animal and plant communities are of great ecological interest. Data are presented on the seasonal occurrence of the species found, their relative abundance, and their rate of growth. Fouling occurs through June-September but is most rapid during July-August. Preliminary observations on the influence of depth, method of panel suspension, location, and other ecological factors are reported in detail.

A new parasitic dinoflagellate from fresh-water fish, D. L. JACOBS. (Univ. Minn.) (*Amer. Micros. Soc. Trans.*, 65 (1946), No. 1, pp. 1-17, illus. 15).—*Oodinium limneticum* n. sp. is described as parasitizing nine species of exotic fresh-water fish kept in an aquarium; its life history and pathological, taxonomic, and certain ecological relationships are discussed.

[Abstracts of papers presented before the American Society of Parasitologists, March 28-30, 1946] (*Jour. Parasitol.*, 31 (1945), Sup., pp. 15-18, 16-17, 18, 19-20, 23-24, 25).—The following are included: Tumor Formation as a Reaction to *Litomosoides carinii*, a Filariid of the Cotton Rat, by J. A. Scott and J. B. Cross (pp. 15-16); Anatomical Studies on the Fourth Stage Larvae and Adults of *Litomosoides carinii*, a Filariid of the Cotton Rat, by J. B. Cross and J. A. Scott (pp. 16-17); Infection Experiments With a Hookworm of the Cotton Rat, by L. J. Thomas (p. 18) (Univ. Ill.); Cercarial Production in Snails and Metacercarial Infections in Fish From Carrol Lake, Wisconsin, by L. O. Nolf (pp. 19-20) (Univ. Wis. et al.); Studies on Parasites of Bassalian Fishes, by R. F. Nigrelli (p. 23); the Nematode Parasites of the Bufoninae (Amphibia: Salientia: Procoela; Bufonidae), I-III, by A. C. Walton (pp. 23-24); and Chemotherapy of Filariasis (*Litomosoides carinii*) in the Cotton Rat by the Administration of Stibanose (= Solustibosan), by J. T. Culbertson and E. Pearce (p. 25).

Insects and the spectrum, H. B. WEISS (*Jour. N. Y. Ent. Soc.*, 54 (1946), No. 1, pp. 17-30).—In a previous paper the results of various workers were

summarized with respect to insect responses to colors (E. S. R., 92, p. 238). The present article was written to gather from the literature (94 references) any additional evidence that might have a bearing on insect responses to color stimuli.

Waterproofing mechanism of an insect egg, J. W. L. BEAMENT (*Nature [London]*, 157 (1946), No. 3936, p. 370).—Water proofing of the eggshell of *Rhodnius prolixus* (Hemiptera) is reported in this preliminary account to consist of a wax layer about 0.25μ thick covering the inner surface of the shell.

Connecticut State entomologist, forty-fourth report, 1944, R. B. FRIEND ET AL. (Partly coop. U. S. D. A. et al.). (*Connecticut [New Haven] Sta. Bul.* 488 (1945), pp. 297-425+, illus. 18).—The following reports are included: Work of the Department, by R. B. Friend (pp. 301-308); Inspection of Nurseries, 1944 (pp. 308-311), Inspection of Apiaries (pp. 313-317), and Dutch Elm Disease (pp. 322-323), all by M. P. Zappe; Quarantine Enforcement and Miscellaneous Inspections, 1944, by M. P. Zappe and L. A. DeVaux (pp. 311-313); Gypsy Moth Control, by D. LaBelle and R. B. Friend (pp. 319-321); Mosquito Control in 1944, by R. C. Botsford (pp. 323-329); Rodent Control, by F. B. Schuler (p. 329); Report on Parasites (p. 330) and High Mean Temperatures as Affecting Plum Curculio Damage on Apples During the Past Seven Years (pp. 339-341), both by P. Garman; Status of the Natural Enemies of the Japanese Beetle in Connecticut (pp. 331-339) and Egg Parasitism of the Fall Cankerworm (*Alsophila pometaria* (Harris)) (pp. 416-418), both by J. C. Schread; The European Apple Sawfly, by P. Garman and J. F. Townsend (pp. 341-344); Wireworm Investigations, by D. E. Greenwood (pp. 344-347); DDT Dusts in Dosage Tests on Vegetable Pests (pp. 348-353), Use of Disodium Ethylene Bis Dithiocarbamate (Dithane) on the Soil to Control Insect Pests of Plants (pp. 353-356), and Effect of an Alkaline Diluent on Cryolite Dust (pp. 357-358), all by N. Turner; Certain Effects of Defoliation of Deciduous Trees (pp. 358-373) and Biology and Control of the Dogwood Borer *Synanthedon scitula* Harris (pp. 373-395), both by P. P. Wallace; The Corpora Allata of Mosquitoes, by D. Bodenstein (pp. 396-405); and Notes on the Effect of Aluminum Sulfate and Kolofog in Lime Sprays Applied to Soybeans as Repellents for the Japanese Beetle (pp. 405-406), *Aphonus castaneus* Melsh. (pp. 407-411), and The Incinerator Beetle *Dermestes cadaverinus* Fabr. (pp. 411-415), all by J. P. Johnson. Miscellaneous insect notes are also included.

A review of twenty-five years of economic entomology in the Island of Mauritius, L. A. MOUTIA and R. MAMET (*Bul. Ent. Res.*, 36 (1946), No. 4, pp. 439-472, illus. 15).—The authors discuss the practical results achieved in the past 25 years' work on the major insect problems of Mauritius. There are 78 references.

The general ecological characteristics of the outbreak areas and outbreak years of the Australian plague locust (*Chortoicetes terminifera* Walk.), K. H. L. KEY (*Austral. Council Sci. and Indus. Res., Bul.* 186 (1945), pp. 127+, illus. 32).—This detailed report describes the general ecology of the outbreak areas and years with special reference to those features which are important in relation to swarm formation. The main part of the text is taken up with the general climatic and topographical characteristics—with the interaction between these two factors, delimitation and description of the individual outbreak areas in Australia, and regions in which outbreak areas could develop on clearing.

The identification of nymphs of the genus *Melanoplus* of Manitoba and adjacent areas, R. H. HANDFORD (*Sci. Agr.*, 26 (1946), No. 4, pp. 147-180,

illus. 28).—The author describes and compares 21 species of this genus of spur-throated locusts—18 of them from Manitoba. A tentative key to 19 species of adult ♀♀ is included.

Differential feeding in relation to local distribution of grasshoppers, F. B. ISMAY (*Ecology*, 27 (1946), No. 2, pp. 128-138, *illus. 2*).—Photographic records of the feeding behavior of five midsummer species confirmed the basic fact of differential feeding by grasshoppers. Graminivorous species—in nature thriving best in mesophytic habitats—selected succulent grasses for their food when caged. Species more tolerant of xeric environments refused succulent grasses and fed on the more mature native grasses typically found in drier situations. Critical field observations over a 3-yr. period of a backyard area with seven distinct types of vegetation definitely correlated grasshopper distribution under natural conditions with differential feeding behavior under insectary environments. A far-reaching program on the ecology of the Acrididae is urged as promising valuable contributions to an understanding of terrestrial communities and control of pest grasshoppers.

Comparative morphology and taxonomy of the Capniidae (Plecoptera), J. F. HANSON (*Amer. Midland Nat.*, 35 (1946), No. 1, pp. 193-249, *illus. 66*).—Detailed comparative studies of insects, particularly within the genera and species, are said to have been few; not until such studies are made can it be expected that the phylogenetic and taxonomic relationships of the insects concerned will be understood. It is the author's hope that this paper on one family of the stone flies "partially fulfills a need for such work in one small niche of taxonomic entomology." There are two pages of references.

Two new *Paraclius* (Diptera: Dolichopodidae), F. C. HARMSTON and G. F. KNOWLTON. (*Utah State Agr. Col.*). (*Jour. Kans. Ent. Soc.*, 19 (1946), No. 1, pp. 23-25).—Collections taken during recent years have made possible this treatment of three interesting species of *Paraclius*; two are here described as new and a key is given to aid in their separation.

Types of genera and subgenera of Pipunculidae, W. F. RAPP, JR. (Univ. Ill.). (*Canad. Ent.*, 77 (1945), No. 11, p. 209).—This annotated list of genera and subgenera has been compiled to aid workers in the family Pipunculidae the big-eyed flies.

The *Erythroneura* of the vulnerata group (Homoptera: Cicadellidae), R. H. BEAMER (*Jour. Kans. Ent. Soc.*, 19 (1946), No. 1, pp. 15-22, *illus. 1*).—Includes keys to the groups and species of this genus and one new species.

The genus *Stenocranus* in America north of Mexico (Homoptera: Fulgoroidea: Delphacinae), R. H. BEAMER (*Jour. Kans. Ent. Soc.*, 19 (1946), No. 1, pp. 1-11, *illus. 2*).—Includes new taxonomy.

Two new characters in the Geometridae, W. T. M. FORBES. (Cornell Univ.). (*Jour. N. Y. Ent. Soc.*, 54 (1946), No. 1, pp. 39-46).—This insect family—with over a thousand genera and far more than 10,000 species—is said to have suffered in its classification from lack of good characters that could be seen without dissection. In an attempt to define the genera of the eastern United States better, the author discusses two structures—the chaetosema and the gena—that are easy to see. The first shows good grouping characters, while the second appears erratically—often differing between closely related genera and in a few cases within an obviously sound genus—but is easily seen and rarely shows intermediate states.

Notes on some skippers, with new records for the United States (Lepidoptera: Hesperiiidae), H. A. FREEMAN (*Canad. Ent.*, 77 (1945), No. 11, p. 201).

Flights of *Nymphalis californica* Bdv. in British Columbia and Alberta in 1945, H. B. LEECH (*Canad. Ent.*, 77 (1945), No. 11, p. 203).—The spiny caterpillars of this butterfly are known as defoliators of *Ceanothus* spp. The flight records given are considered of particular interest in that no reports of damage by the caterpillars were received during 1945.

The occurrence in North America of the European staphylinid *Deleaster dichrous* Grav., C. G. MACNAY (*Canad. Ent.*, 77 (1945), No. 11, p. 213).—Believed to be the second record of this beetle in North America.

A new Phyllophaga from Alabama and Georgia (Scarabaeidae: Coleoptera), O. L. CARTWRIGHT. (S. C. Expt. Sta.). (*Ent. News*, 57 (1946), No. 1, pp. 10-12, illus. 1).—*P. hubbells* n. sp. is described.

Studies on the milky disease of Japanese beetle larvae, R. L. BEARD (*Connecticut [New Haven] Sta. Bul.* 491 (1945), pp. 501-588, illus. 27).—The type-A milky disease of the Japanese beetle is caused by *Bacillus popilliae*; the available published material on it is reviewed (52 references) as a background for the present studies. The normal invasion route is via the alimentary canal; both vegetative and spore forms seem to be infective, but the spores apparently germinate before reaching the hemolymph. Though not fully proved, the evidence indicates the malpighian tubules to be the most probable site of penetration from the gut into the blood. The course of the disease in this study is divided into four phases, viz, invasion, incubation, sporulation, and completion; the time required for the disease to develop was found largely a function of temperature. Infected grubs may live and feed for a longer or shorter time; when diseased the young grubs die sooner than the older ones. Molting and metamorphosis of the host is inhibited even when prompt death does not ensue. There is no apparent disturbance of body tissues or organs other than the blood; changes in the inorganic chemical constituents, number of blood cells, osmotic pressure, and pH of the blood, or its manner and time of coagulation are considered too slight to account for the over-all effect of the disease. At least one enzyme system is, however, commonly disturbed, and it is believed that the pathologic effects may be due to the destruction of one or more enzyme systems. The probability of a grub becoming infected increases with the spore dose. The three larval instars appear equally susceptible.

As tested, grubs fed prior to inoculation exhibited susceptibilities not differing significantly from those removed from cold storage at inoculation time. Grubs incubated at 75° and 85° F. appeared equally susceptible to inoculation. Spores kept as dried blood films showed no loss of potency with time; exposure in soil to weather caused no loss in potency. A single test indicated that fresh spores were six times as potent as those in dust form; exposure to ultra-violet light (sun lamp) caused very marked reductions in potency. Although low pH appears to affect spores adversely, the pH of soils usually encountered in Connecticut did not significantly affect their potency; marked loss of potency followed them at temperatures above 194°. The effect on potency of successive passages of the bacteria through a series of hosts was not well defined; some loss of potency was observed when the spores were kept refrigerated in water suspension. The average number of spores produced per grub approximated 2 billion; the number produced was not correlated with body weight of host, temperature of incubation within favorable limits, or size of inoculum. Healthy grubs may acquire the disease by biting diseased individuals; more commonly, it is acquired by ingesting spores along with food. Disintegration of diseased grubs serves to liberate spores to the soil, where dissemination is much more prompt than from intact individuals.

As measured by bioassay methods, the spores tend to remain more concentrated in the top 2 in. of soil, but there is some vertical spread of spores applied to the surface.

Several experiments demonstrated the importance of heavy grub populations for rapid spread of the disease; a high inoculum potential also favors it. The spread of infection was observed over periods of time among third instar grubs and among developing populations reared under different conditions. In several instances, an increasing inoculum failed to result in a progressive increase in incidence; instead, a period of increasing morbidity was followed by a decline. The reason for this result was that the infection rate at first exceeds the mortality rate; later the mortality rate exceeds the infection rate. The slower infection rate may be due, in part, to an accumulation of more resistant grubs. The role of *B. popilliae* as a parasite is discussed, and comparisons are made between infection trends of milky disease and characteristic epidemic curves.

Wheel-bug vs. Japanese beetle, S. W. BROMLEY (*Ent. News*, 57 (1946), No. 1, p. 21).—A brief note reporting the killing of large numbers of Japanese beetles by the wheel bug.

Daily fluctuations in aboveground activity of three species of ants, M. TALBOT (*Ecology*, 27 (1946), No. 1, pp. 65-70, illus. 2).—The daily fluctuations in above-ground activity in the three species of ants—*Formica pallidefulva schaufussi incerta* Emery, *Lasius niger neoniger* Emery, and *Myrmica sabuleti americana* Weber—were studied on a sand ridge in Michigan during July-August 1944. The heights of activity came at different times of day for the three species, these daily fluctuations in activity apparently being correlated primarily with temperature changes; reactions to humidity and to light also differed among the three species. Detailed findings are reported.

A new house-invading ant from Massachusetts, J. ENZMANN (*Jour. N. Y. Ent. Soc.*, 54 (1946), No. 1, pp. 47-49, illus. 2).—*Myrmica (Myrmica) brevinodis transversinodis* n. var. is described from Massachusetts.

On Euphiloides, an oriental subgenus of Crossocerus (Hymenoptera: Sphecidae: Pemphilidini), V. S. L. PATE. (U. S. D. A.). (*Ent. Soc. Wash. Proc.*, 48 (1946), No. 3, pp. 53-60, illus. 3).—The new subgenus, the three species (two new), and one new subspecies are described. A key to the forms is provided.

✓ North American species of the genus Lestiphorus (Hymenoptera: Sphecidae: Gorytini), V. S. L. PATE (*Canad. Ent.*, 77 (1945), No. 11, pp. 210-213).—A taxonomic study of this small genus of relatively rare wasps distributed throughout the Holarctic region, including a key to the Nearctic species and a copious annotation of the three species included.

Microphotography as an aid to the identification of trombiculine larvae, D. A. GILL and E. PARRISH (*Jour. Council Sci. and Indus. Res. [Austral.]*, 18 (1945), No. 4, pp. 298-300, illus. 12).—The difficulty in identifying somewhat similar species of trombiculine mites from descriptions, drawings, and measurements is discussed; use of photomicrography of the whole mite and of its dorsal scutum is recommended as an additional aid. The technic used to obtain the accompanying illustrations is detailed; a complete series of such photographs covering all known species would, it is believed, be of great assistance.

The place of new sprays and dusts in the control of insects and diseases: A panel discussion led by E. N. CORY (*Peninsula Hort. Soc. [Del.] Trans.*, 59 (1945), pp. 18-41).—The following brief papers are included: Recent

Experimental Results with DDT on Control of the Codling Moth, by W. S. Hough (pp. 19-25) (Va. Expt. Sta.); **Results With DDT for Codling Moth Control, Delaware, 1945**, by P. L. Rice and L. A. Stearns (pp. 26-31), and **New Developments in Fungicides**, by J. W. Heuberger (pp. 36-41) (both Del. Sta.); and **800 Acres With DDT—West Virginia Grower Reports on Experience of Three Seasons**, by H. W. Miller, Jr., (pp. 32-35).

New fumigant controls most important greenhouse pest, W. E. BLAUVELT. ([N. Y.] Cornell Expt. Sta.). (*Farm Res.* [New York State and Cornell Stas.], 12 (1946), No. 2, pp. 12-13).—Studies have shown that azobenzene, when used as a fumigant in vapor form, appears to offer for the first time a satisfactory chemical control for red spider mite on roses, as well as an improved control for other florist crops. Although first made available commercially in November 1945, over 30,000 pounds of azobenzene powder have been purchased by growers, and four companies are marketing the recommended formulation, which contains 70 percent of azobenzene.

Low temperature fumigation, H. A. U. MONRO (*Canad. Ent.*, 77 (1945), No. 10, pp. 192-196).—The author briefly reviews the problem of conducting fumigations below 60° F. for controlling insect pests, including a discussion of the literature (10 references). Experiments with the European corn borer revealed that methyl bromide can penetrate cold bales of broomcorn at temperatures as low as 26°—and probably lower—in toxic amounts by employing increased dosages as the temperature is lowered. No fan was used to circulate the fumigant, but problems of distribution under practical space-fumigation conditions could not be properly duplicated since the test vault used could hold only one bale and the fumigant was discharged directly above it.

Factors influencing the interaction of insecticidal mists and flying insects.—I, The design of a spray testing chamber and some of its properties, W. A. L. DAVID (*Bul. Ent. Res.*, 36 (1946), No. 4, pp. 373-393, illus. 4).—The considerations influencing designs of spray-testing chambers are discussed, and a description is given of equipment specifically intended for use with most mosquitoes as test insects. In its essentials, the apparatus consists of a metal chamber surrounded by a "Masonite" cabinet, with an air space between the two. In this space, air at constant temperature is circulated around the outer face of the inner metal chamber for temperature control. The cabinet is fitted with lights, wet and dry bulb thermometers to check the humidity—controlled by blowing in steam—a fan to circulate air, a spray gun, four ports through which the insect exposure cages are introduced, a shelf to carry the cages, and an exhaust and intake port to allow the mist to be removed at the end of a test. In practice the apparatus gave satisfactory results, permitting accurate comparisons between different strengths of a given insecticidal solution; care must be taken, however, to insure that the nonvolatile contents of sprays being compared are essentially similar. Examples of application of the method to pyrethrum, DDT, and activated sprays are given. The results of the various experiments are fully described in the text. It is concluded that temperature influences considerably the level of kill recorded, but humidity seemed to have little or no effect within the range 40 to 80 percent relative humidity. Increasing the interval at which the insects were inserted after spraying for 0 to 10 min. influenced the level of kill without affecting the comparative efficiency of the insecticides examined. Caging the insects, on the other hand, had a pronounced effect on the comparative efficiency of pyrethrin sprays used with and without added non-volatile material.

Investigation of insecticidal sprays. A. B. P. PAGE, A. STRINGER, and R. E. BLACKITH (*Nature [London]*, 157 (1946), No. 3977, pp. 80-81, illus. 2).—To this brief review on the methods of bioassaying insecticides the author adds his results obtained with pyrethrins as activating agents against the yellow-fever mosquito, leading him to the conception of a pair of average threshold values of the amount picked up by the insect which control its responses. The lower value governs the transition from normal to stimulated flight activity; the second, or "knock-down" threshold, shows itself biologically by a sudden rapid increase in the rate of knock-down action with increase of pyrethrin concentration in the spray, but is more evident as a sharp peak in the spray pick-up-pyrethrin concentration curve which varies with the spray dosage in such a way that the corresponding pyrethrin pick-up remains constant, just as the "activation" threshold is independent of the spray dosage. Preliminary investigation of the housefly, northern house mosquito, *Coccinella septempunctata* L., *Vespula vulgans* L., *V. germanica* F.—queens and workers, and *Rhagonycha fulva* Scop. confirmed the existence of both threshold values for these insects also. The method described is believed to open up a new line of attack on the form of the dosage-mortality curve.

Some physical properties of DDT and certain derivatives. H. L. ANDREWS, W. C. WHITE, L. R. GAMOW, and D. C. PETERSON (*Pub. Health Rpts. [U. S.]*, 61 (1946), No. 13, pp. 450-456, illus. 3).—Certain derivatives of DDT have proved of particular interest in studies of the mode of action and fate of ingested DDT. This paper extends the ultraviolet absorption³ to four derivatives and includes the infrared absorption spectra and X-ray diffraction patterns of the five compounds; a crystallographic analysis of DDT is also presented. The X-ray diffraction pattern of DDT was of sufficient intensity to permit its identification in a dust sample when present in a concentration of 10 percent or more; the actual amount of DDT detectable by diffraction pattern was about 1 mg. The other compounds were detected in somewhat smaller concentrations.

The use of D.D.T. as an agricultural insecticide—results of trials, 1944-45. G. A. H. HELSON and T. GREAVES (*Jour. Council Sci. and Indus. Res. [Austral.]*, 18 (1945), No. 4, pp. 301-309).—The trials reported showed that DDT gave effective control of a number of pests, e. g., the southern green stinkbug, black peach aphid, green peach aphid, codling moth, potato tuber worm, cabbage webworm, corn ear worm, diamondback moth, imported cabbageworm, *Doralis fabae* Scop., *Macrosiphum gei* Koch, *Cydia molesta* Busck., *Crocidolomia binotalis* Zell., *Prodenia litura* F., *Caliroa limacina* de Geer, and certain ants. This list contains various species which could not be controlled adequately by previously used insecticides. On the other hand, a few pests proved resistant to DDT in the preparations used, notably the cabbage aphid, woolly apple aphid, and the red spider *Tetranychus urticae* Koch.

Some uses of D. D. T. in agriculture. H. SHAW (*Nature [London]*, 157 (1946), No. 3984, pp. 285-287).—A summary of recent experimental results presented by various workers at a 1945 meeting of the Association of Applied Biologists.

Effects of DDT on cabbage maggot of radish and on aster yellows and the leaf hopper on head lettuce: A progress report. P. H. BOWSER (*Mich. Sta. Quart. Bul.*, 28 (1946), No. 3, pp. 194-200).—The tests presented in this progress report indicate that spraying or dusting against the cabbage maggot must

³ *Public Health Rpts. [U. S.]* Sup. 177 (1944), pp. 32, illus. 8.

begin with emergence of the seedling, and that DDT in certain concentrations applied as a dust gave better control than any treatment previously used at the station. Neither the seed nor the spray treatments were satisfactory, but the 25 and 5 percent dusts applied three times after emergence proved effective and show promise of providing relief from the maggot problem. A 5 percent bait prepared from 100 percent chemical DDT with corn meal was not as satisfactory as the prepared dusts. It is possible that a 10 percent DDT dust may be an intermediate concentration more effective than the 5 and less expensive than the 25 percent mixture. At present a 5 percent mix dust handled properly and applied at proper times is recommended.

It was shown that as the summer season progresses the damage from the six-spotted leafhopper increases up to the September harvest. The largest yields in each crop were obtained where a 25 percent DDT dust was applied; reasonably good control, however, was obtained with a 5 percent dust. Higher concentrations are correspondingly more expensive and likely to give objectionably high residues. The time, number, and method of application need further study. Observations from this progress report indicate that earlier dusting may increase the leafhopper control; it seems also that frequency rather than concentration is most important. It may pay to dust all grass areas and fence rows surrounding lettuce fields to prepare a trap area for migrating hoppers. Since a very low tolerance for DDT has been set up for edible products, it would be hazardous on lettuce, except very early in the season.

Quick-breaking fuel-oil emulsions containing DDT, P. M. EIDE, C. C. DEONIER, and E. NOTTINGHAM. (U. S. D. A.). (*Mosquito News*, 6 (1946), No. 1, pp. 17-19).—Use of 2-percent of an emulsifier containing 5 percent of DDT in No. 2 fuel oil permitted addition of water from mosquito breeding places, thus making it possible to obtain the quantity of spray necessary for thorough distribution of the low dosages of DDT with available equipment. Any emulsifier may be used which will form good emulsions with fuel oil; the emulsion concentrates may be used to form quick-breaking emulsions by diluting 1 part concentrate to 4 parts fuel oil.

The use of DDT and 1080 in Murine typhus control in the Southwest, R. G. UPTON (*Pests*, 14 (1946), No. 3, pp. 24, 26).

More research needed on DDT insecticides, C. E. PALM. ([N. Y.] Cornell Expt. Sta.). (*Farm Res. [New York State and Cornell Stas.]*, 12 (1946), No. 2, pp. 5-6, illus. 1).—This article points out the need for further experimental tests, especially studies which will make possible the development of better dosages and formulations.

Toxic effects of copper on attachment and growth of *Bugula neritina*, M. A. MILLER. (Univ. Calif.). (*Biol. Bul.*, 90 (1946), No. 2, pp. 122-140, illus. 8).—This paper describes physiological experiments dealing with the effect of copper on the attachment and development of *B. neritina*, a widely distributed marine fouling organism; the studies were designed to evolve a clearer understanding of the specific role of copper in the prevention of fouling and the mechanism by which copper surfaces act. Such paint surfaces were found to prevent the establishment of *B. neritina* by repelling or killing the larvae and inhibiting the growth and metamorphosis of attached larvae. A gradient of toxicity extending outward a few millimeters from a copper paint surface was demonstrated. Detailed findings are presented. There are 18 references.

"*Tephrosia noctiflora*" como planta insecticida, A. MUTINELLI (*Rev. Argentina Agrón.*, 12 (1945), No. 4, pp. 291-314, illus. 4; *Eng. abs.*, p. 313).—The author reports 4-yr. experiments with this plant at Misiones, Argentina, finding the roots and seeds to possess high potency as a fish poison and as a contact insecticide. Unlike the plant group producing rotenone, he also found it ecologically adapted to the region and believes it may prove of considerable economic importance to the country.

The ability of the beet leafhopper to regain lost vitality when transferred from unfavorable to favorable host plants, W. C. COOK. (U. S. D. A.). (*Ecology*, 27 (1946), No. 1, pp. 37-46, illus. 1).—Experiments at Modesto, Calif., revealed that ♀ beet leafhoppers fed on desert sage—an unfavorable hold-over host—until they have lost much of their vitality can regain some or all of it by feeding on more favorable plants, such as sugar beets, quail brush, or *Lepidospartum*. Vitality was measured by a standard starvation test and by determining the amount of crude fat present by extraction with ethyl ether or chloroform. The rate at which vitality is regained depends on temperature, being very slow at 45° to 50° F. and more rapid above 55°. Unless it is later demonstrated that feeding on an unfavorable host affects reproduction adversely, the most important result of such feeding is a high mortality. In fall spraying operations against leafhopper, these findings make it possible to center attention first against the favorable host plants, allowing natural mortality to have its effects on unfavorable hosts before spraying is done there. This practice will often reduce the size of the area that must be sprayed.

Contribution à l' étude des Silphes de la betterave en Suisse [Contribution to a study of the carrion beetles (Silphidae) of the beet in Switzerland], H. MARTIN (*Landw. Jahrb. Schweiz*, 59 (1945), No. 9, pp. 757-819, illus. 19; *Ger. abs.*, pp. 817-818).—Part 1 of this monograph deals with the two species of carrion beetles—*Blitophaga opaca* L. and *B. undata* Müll—injurious to beets, considering their history, taxonomy, geographical distribution, morphology and anatomy, biology, ecology, and the nature and importance of the damage which they cause. Part 2 deals more briefly with other insects injurious to beets. There are 32 references.

Influence of aphides upon carbohydrate exchange in cotton, Z. L. NEVSKAYA (*Compt. Rend. (Dok.) Acad. Sci. U. R. S. S.*, n. ser., 48 (1945), No. 5, pp. 369-373).—In leaves of cotton infested with aphids which—in feeding—introduced into the tissues enzymes from their salivary glands, the amylase and invertase activity averaged an increase of 100 percent. Owing to the intense hydrolysis, disaccharides and polysaccharides passed into the only form in which they could be directly assimilated by aphids, viz, monosaccharides; these sugars were ingested so vigorously by the aphids that the concentration of soluble carbohydrates in the sap of the leaf petioles—the first to convey the downward flow of sap—was reduced by an average of 40 percent, and the amount of reserve carbohydrates in the axial organs of the plant was reduced by about 50 percent. The carbohydrate starvation of the vegetative organs led to a lowered supply of nutritive material to the reproductive organs; this resulted in shedding at the critical periods of growth and also influenced the quality of the raw cotton in the bolls that escaped.

Les adultes de doryphore peuvent s'attaquer à leurs propres oeufs [Adults of the Colorado potato beetle attacking their own eggs], M. DURCHON (*Compt. Rend. Acad. Sci. [Paris]*, 222 (1946), No. 6, pp. 340-342).

Recommendations for control of borer by dusting with cryolite. (La. Expt. Sta. and U. S. D. A.). (*Sugar Bul.*, 24 (1946), No. 15, pp. 116, 118).—These recommendations for controlling the sugarcane borer in 1946 were prepared jointly by the Louisiana Station and the U. S. Bureau of Entomology and Plant Quarantine.

Additional host and distribution records of the sweetpotato leaf beetle *Typophorus viridicyaneus* (Crotch) (Coleoptera: Chrysomelidae), R. L. PARKER. (Kans. Expt. Sta.). (*Jour. Kans. Ent. Soc.*, 19 (1946), No. 1, pp. 11-12).—Further information (E. S. R., 94, p. 503) is presented on this beetle, which has been reported to cause considerable damage to sweetpotatoes in Kansas.

Hessian fly in the spring wheat of southwestern North Dakota. R. W. SMITH. (Coop. U. S. D. A.). (*North Dakota Sta. Bimo. Bul.*, 8 (1946), No. 4, pp. 3-6).—In 1944, after a succession of cool seasons with good rainfall, reports came in of unusual insect injury—later shown to be from the hessian fly. Varietal plots of spring wheat at the station began to show the injurious effects of these pests early in June, and records were made of the relative numbers of the flies on the different varieties. With few changes in varieties, 29 spring wheats were again seeded in the field in 1945; with some exceptions, those with but few flies in 1944 had few again in 1945. Results for the 2 yr. are not conclusive, but observations of farmers in the area agreed with the station results as showing that Mida wheat was definitely more resistant than other commonly grown standard varieties of spring wheat. There was also a definite tendency for the yields to drop as the insect infestation increased. Though Mida is not immune, it may have enough resistance to render losses negligible where it is grown; this variety is being employed in breeding work.

The effect of Say stinkbug feeding on wheat. L. A. JACOBSON (*Canad. Ent.*, 77 (1945), No. 11, p. 200).—The Say stinkbug is reported to be a comparatively new pest of wheat and other seed crops in western Canada, doing severe damage to wheat in many localized areas. Damage to ripening grain is caused by the feeding of adults as well as occasional nymphs, both of which are usually very abundant in early spring around weeds, along roadways, ditches, and field margins and in abandoned fields. The results of a survey of a severe outbreak at Turin, Alberta (1941), are briefly presented.

Aphids on Canada wild rice. J. B. ADAMS. (*Canad. Ent.*, 77 (1945), No. 10, p. 196).—Note on heavy infestation by the apple grain aphid.

The European chafer in lawns. F. L. GAMBRELL. (N. Y. State Expt. Sta.). (*Farm Res. [New York State and Cornell Stas.]*, 12 (1946), No. 2, pp. 19-20, illus. 2).—Grubs of the European chafer are reported to be troublesome in lawns of restricted areas in western New York. Experimental evidence has shown that lead arsenate as spray or dust applied at a minimum dosage of 500 lb. per acre (1 lb. to each 100 sq. ft. of lawn) will afford considerable protection against the next brood of grubs. It is highly desirable to "wash in" the arsenical to avoid danger to children or animals; early spring application takes advantage of alternate freezing and thawing and frequent heavy rains. Preliminary results with DDT are said to give promise.

One year's results from dusting snap beans to control anthracnose and leaf hoppers. E. H. BJORNSETH (*Michigan Sta. Quart. Bul.*, 28 (1946), No. 3, pp. 191-196).—On the basis of 1945 tests it is apparent that leafhoppers cause considerable losses in the early snap bean crop and that DDT properly applied will control them. Tolerance for the amount of DDT residue permitted on vegetables has been determined by the Federal Food and Drug Adminis-

tration; it is probable, in view of the rapid growth of bean pods, that the amount of residue would be below this tolerance if 3 percent DDT dust were applied so that the third treatment came a week before the first picking and the fourth just after it. The cost of four applications was about \$15 per acre; the yield was increased 66.65 bu. Early snap beans usually sell at the highest price; the practice should thus be economical and profitable for the early crop. The 1945 conditions were unfavorable for anthracnose, so the value of Fermate could not be determined. Late in summer, however, conditions are usually favorable to its spread, and it is believed possible that use of such a fungicide would be justified.

The hop-vine borer and its control in New York hop yards, R. O. MAGIE and F. G. MUNDINGER. (N. Y. State Expt. Sta.). (*Farm. Res. [New York State and Cornell Stas.]*, 12 (1946), No. 2, pp. 11-12, illus. 3).—The life history and control measures for the hopvine borer (*Hydroecia immanis* Guenee) are discussed. Among the possible control measures are elimination of grasses on which eggs are laid within and near hopyards, destruction of eggs during the dormant season by burning or spraying, killing larvae within hopyards, and destruction of migrating, newly hatched larvae. Of these the first is deemed the most positive and in the long run the least expensive.

DDT for the control of onion thrips, J. P. SLEESMAN (*Ohio Sta. Bimo. Bul.* 239 (1946), pp. 39-40).—In the test reported, DDT gave the most outstanding performance of any material used on onions during the past 15 yr. Each application reduced to and maintained a very low level in the thrips population for at least 7 days. Three formulations were compared: DDT as a wettable powder, solubilized in an oil emulsion, and a 3 percent dust mixture; equally good control and yields were obtainable with all three. DDT thus appears to be a practical and effective control for the onion thrips; additional information on dosage, residual efficiency, spray intervals, and other factors must be obtained, however, before this insecticide can be used most effectively and efficiently.

Influence of population number on egg production in the four-spotted pea beetle, *Bruchus quadrimaculatus* Fabr., A. BRAUER. (Univ. Ky.). (*Ky. Acad. Sci. Trans.*, 11 (1943-44), pp. 56-62, illus. 1).—It is experimentally shown that maximum egg production is realized when single pairs are confined in relatively small volumes of peas; as the number of pairs increased there was a steady decline for each additional pair. Sexual contact appeared definitely to be the chief biotic factor responsible for the drop in egg production of the more crowded cultures. The normal laying behavior insures a distribution of eggs over numerous peas—a condition favorable to larval feeding. Crowded cultures prevent the freedom required by the ♀♀ for this behavior in that they are continually aggravated by moving beetles or by soliciting ♂♂. When peas become overinfested with eggs, the feeding larvae later crowd one another from their excavations before feeding is completed and maturity reached; these fail to pupate and mature. A priori reasoning would lead to the conclusion that for a given volume of peas there must be an optimum population number which is large enough to insure sufficient sexual contacts between beetles for maximum egg production yet not great enough to overstock the peas with eggs and larvae.

Japanese beetle abundance and injury on sweet corn, L. A. CARRUTH, L. M. BARTLETT, and J. A. ADAMS (*New York State Sta. Bul.* 715 (1946), pp. 16, illus. 3).—Since 1943 beetle populations on western Long Island have declined steadily because of drought during 1943 and 1944 and the increased activity

of natural enemies, particularly *Tiphia* parasites and the bacterium causing milky disease. The heaviest infestations of beetle abundance during the summer period were on the silks, and the heaviest infestations on the silks were found to occur approximately 1 week after the first appearance of the silks. Beetle populations occurring a week after silking apparently had little effect on ear pollination, although later beetle feeding is probably more important for the direct injury produced and for secondary injuries from birds, corn smut, and other causes. It was observed that within the same cornfield beetle populations were lighter in the center than at the edges, particularly when the latter adjoined hedgerows and grassy areas. Studies on the factors influencing beetle abundance and spread suggest that no severe general damage may again be expected in Nassau County, but cornfields near Suffolk, Rockland, Westchester, and Putnam counties may be menaced for several years. Plantings of corn in the vicinity of the larger cities along the Hudson River in Orange, Ulster, Dutchess, and southern Columbia counties may be affected. In the southern two-thirds of the State the authors believe that infestations with the Japanese beetle are likely, but hope that serious damage may be minimized through distribution of parasites and spores causing milky disease.

Progress report of pest control, W. J. O'NEILL. (Wash. Expt. Sta.). (*Wash. State Hort. Assoc. Proc.*, 41 (1945), pp. 27-33).—Research with DDT for controlling fruit insect pests has been intensive during the past 2 yr.; the author briefly summarizes the findings in Washington State and elsewhere, with discussion.

Experiences with DDT for codling moth in western New York, S. W. HARMAN. (N. Y. State Expt. Sta.). (*Farm Res. [New York State and Cornell Stas.]*, 12 (1946), No. 2, pp. 1-3).—A discussion of DDT for codling moth control under western New York conditions with observations on the residue question and possible disadvantages of this material. Studies indicate that DDT is probably the most effective insecticide used against codling moth, although some failures have resulted because of poor timing and inefficient spraying. The author also considers that, because of the limited knowledge of DDT and the possibility of secondary problems resulting from its use, the application of DDT is still in the experimental stage. Nevertheless, for fruit growers who have failed to handle their codling moth problem with lead arsenate there appear to be legitimate reasons for using DDT.

Valeur insecticide des huiles végétales dans la lutte contre le pou de San José (*Quadraspidiotus perniciosus* Comst.) [The insecticidal value of vegetable oils for control of San Jose scale], G. VIEL (*Compt. Rend. Acad. Sci. [Paris]*, 221 (1945), No. 20, pp. 589-590).—Peanut oil proved more active than any of the other plant oils tested, viz, bigseed falseflax, rape (cameline, navette), cottonseed, linseed, and grape seed. It was inferior to refined white petroleum oil, but its effectiveness in a 2.8 percent emulsion was above that of a 1.6 percent mineral oil emulsion. Because of the extraordinary fecundity of the San Jose scale, a satisfactory insecticide must have an effectiveness of over 97 percent kill; peanut oil is said to give emulsions which at 3.5 to 4 percent of oil satisfy this condition. The other oils—even at high enough concentrations to injure the plant—possessed insufficient insecticidal properties.

Further data on the value of hand control of the tent caterpillar *Malacosoma americana* Fabr. (Lepidoptera: Lasiocampidae), H. L. SWEETMAN. (Mass. State Col.). (*Canad. Ent.*, 77 (1945), No. 11, pp. 202-203).—Destruction of this pest just as the colonies are becoming established in tents was found to be accomplished with minimum effort by the mechanical method

described; little feeding has occurred at this stage. The present 10-yr. findings fully corroborate those reported earlier.⁴ Application of an insecticide before the eggs hatch or on the newly formed tents would cost more in time and money than the crushing method used; this procedure—with the limitations noted in the earlier paper—is strongly recommended.

The cherry fruitfly problem in eastern Washington, P. M. EIDE. (Wash. Expt. Sta.). (*Wash. State Hort. Assoc. Proc.*, 41 (1945), pp. 55-61).—The life history and description of the cherry fruitfly are briefly presented. The pest is reported to have been common in lower Yakima Valley commercial orchards during 1945. In experimental tests, DDT had practically no effect on it and cryolite gave very poor control; rotenone gave a definite reduction in wormy fruits but without satisfactory control; xanthone gave results about like lead arsenate; phenothiazine was believed to act as a repellent, and how it might perform on an entire orchard is problematical. Clean picking of the fruit is advised, and a spray program based on current findings is presented.

Pear psylla control in 1945, L. G. DAVIS. (U. S. D. A.). (*Wash. State Hort. Assoc. Proc.*, 41 (1945), pp. 145-149).—A survey of pear psylla control in commercial orchards of the Pacific Northwest in 1945, with a brief outline of the control program.

Some possible uses for DDT on soft fruits, E. J. NEWCOMER. (U. S. D. A.). (*Wash. State Hort. Assoc. Proc.*, 41 (1945), pp. 51-53).—A brief review of possible uses of DDT against the insect pests of soft fruits; no recommendations for this purpose can as yet be made.

Characters, distribution, and food plants of phlepsid leafhopper vectors of California aster-yellows virus, D. M. DELONG and H. H. P. SEVERIN (*Hilgardia* [California Sta.], 17 (1945), No. 1, pp. 1-20, illus. 6).—This paper deals with the characters, distribution, habitat, and food plants of six species of phlepsid leafhopper vectors. The general distribution, habitat, and food plants, and a key for identification of the six species are given, followed by information on *Phlepsius apertinus* Osborn and Lathrop, *Texananus lathropi* Baker, *T. pergradus* DeLong, *T. spatulatus* Van Duzee, *T. oregonus* Ball, and *T. latipex* DeLong. Plates showing details of the six species are given, as well as a list of the more important references.

Evidence of nonspecific transmission of California aster-yellows virus by leafhoppers, H. H. P. SEVERIN (*Hilgardia* [California Sta.], 17 (1945), No. 1, pp. 21-59, illus. 3).—These studies showed that six new vectors carry the California aster yellows virus, which proves that the virus is not transmitted by a specific leafhopper. Infections produced by 150 males and 150 females of *Texananus lathropi* Baker, each kept singly on a healthy celery plant, were 18.7 and 16.0 percent, respectively, and by 100 males and 100 females of *T. latipex* DeLong were 18.0 and 32 percent, respectively. It was observed that lower percentages of infections occurred with asters than with celery, and with one exception lower percentages of asters were infected in daily than in weekly transfers. A higher percentage of infection in celery with lots of 5, 10, and 20 adults indicated that the number of leafhoppers plays a role in virus transmission. With *T. lathropi* the minimum latent period of the virus in the males and females was 7 and 8 days, respectively, whereas with *T. latipex* with one lot of 80 males it was 8 days. The maximum latent period in *T. lathropi* was 33 days compared with 37 days in *T. latipex*. Life history observations were made covering the egg periods, egg-laying capacity, and duration of the nymphal instars.

⁴ Canad. Ent., 72 (1940), No. 12, pp. 245-250.

The aster yellows virus was not transmitted by the first nymphal instar of *Texanonus spatulatus* Van Duzee, but all other nymphal instars transmitted the virus. Thirty-four percent of the celery was infected by single males and 29 percent by single females, whereas lots of 5 males transmitted the virus to 88 percent and lots of 5 females to 72 percent of the first set of celery and to 40 and 50 percent of the second set, respectively. With this species the latent period of the virus in the adults was 6 to 42 days. One male retained the virus for 84 days, and one female 99 days. In most instances adults caused one infection and then apparently lost the infective dose.

Attempts to transmit curly-top virus by means of *T. spatulatus* failed, as did attempts to transmit Pierce's disease of grapevines and alfalfa dwarf to healthy grapevine seedlings and alfalfa. Males and females of *T. oregonus* Ball tested singly on healthy celery infected 5 of 14 plants and 11 of 22 plants, respectively. With *T. pergradus* DeLong there was no infection when 100 males and females were kept singly on healthy celery, but 1 aster was infected by 1 of 50 males. Twelve lots of 10, 25 lots of 20, and 5 lots of 40 males produced 1, 5, and 1 infection. In the case of *Phlepsius apertinus* Osborn and Lathrop, 13 males and 12 females infected 7 of 13 and 8 of 14 celery plants, respectively. Lots of 2 to 30 adults produced 14 infections.

The lily weevil, a potentially serious pest in the Pacific Northwest, C. F. DOUCETTE and R. LATTA (*U. S. Dept. Agr. Cir. 746 (1946), pp. 24, illus. 18*).—The lily weevil is considered a potential pest of Easter lilies in the Pacific Northwest, since adults feed on the leaves of lilies of many species and larvae feed in the stems and bulbs. The weevil occurs along the Pacific coast from Vancouver Island, British Columbia, to the northern part of California. Females deposit eggs by inserting them in the epidermis of the lower leaves of the host plant during May. Hatching occurs 15-20 days later. Larvae attack the underground portions of the plants, stems, or bulbs, and become mature in September. At this time they leave the stems or bulbs and form cells 10-15 in. below the surface of the soil. The larvae remain more or less inactive in these soils until transforming to pupae the following summer and changing to adults late in the summer but the adults remain in the soils until the following spring; thus a life cycle covers 2 yr. Plantings of lilies which are close to brushy areas where native host plants of this weevil are present are likely to suffer serious injury. During the period of time between adult appearance and the beginning of egg deposition the adults feed on the lily foliage. This permits efficient use of stomach poisons for control, and lead arsenate (2 lb. to 50 gal. of water plus sticker) has been found effective.

Report on the survey of the insects and pests attacking the Bermuda cedar, R. L. PARKER. (Kans. State Col.). ([Hamilton]: *Bermuda Bd. Agr.*, (1945), pp. 5+).

New descriptions of larvae of forest insects: *Nyctobia*, *Eufidonia* (Lepidoptera: Geometridae), W. C. MCGUFFIN (*Canad. Ent.*, 77 (1945), No. 11, pp. 197-199, illus. 2).—Among the several species of green loopers found on Canadian conifers in July are two which to the naked eye appear somewhat similar. Larvae of these two—*N. limitaria* Wlk. and *E. notataria* Wlk.—are described along with that of the other Nearctic species, *E. discospilata* Wlk., which is a health-plant feeder.

Entomology in western pine silviculture, F. P. KEEN. (U. S. D. A.) (*Pan-Pacific Ent.*, 22 (1946), No. 1, pp. 1-8).—The presidential address read before the Pacific Coast Entomological Society, January 12, 1946.

A revision of the family Acaridae (Tyroglyphidae), order Acari, based on comparative morphological studies.—I, Historical, morphological, and general taxonomic studies, H. H. J. NESBITT (*Canad. Jour. Res.*, 23 (1945), No. 6, Sect. D, pp. 139–188, illus. 55).—The author's purpose is to lay the basis for some serious work on comparative acarology; for this purpose the restricted group Acaridae was selected, and the results of a detailed morphological study based on about 40 species representative of the various genera are presented. The classifications of other workers are briefly reviewed and evaluated in the light of the author's findings, a discussion of the composition and interrelationships of the various genera and higher groups is given, and a synopsis of the tribes and genera of the family—based on characters believed to be of phylogenetic significance—is included. The extent of damage caused by these mites to grain and farinaceous products in storage has warranted a thorough investigation of the habits and systematic position of these economic pests.

Life history and habits of the flat grain beetle (*Laemophloeus minutus* Oliv.), N. M. PAYNE (*Jour. N. Y. Ent. Soc.*, 54 (1946), No. 1, pp. 9–12).—This beetle was reared on whole-wheat flour or shorts as well as on siftings from weevil cultures; it may live as a scavenger but can also live on sound material. At 78° F. and humidity near saturation, the duration of the immature stages was 46 to 57 days; adults lived for 6 mo. to 1 yr.

A new species of nitidulid beetle, L. G. GILLOGLY (*Pan-Pacific Ent.*, 22 (1946), No. 1, pp. 22–24, illus. 1).—Dried fruit beetles are said to be of considerable importance in the processing and storing of certain California agricultural products; those most often found in drying or rotting fruit are those of the genera *Carpophilus* and *Haptoncus*. Until recently only one species of the latter (*H. luteolus* (Erich.)) was known to the State fauna. *H. californicus* n. sp. is here described and illustrated.

The influence of certain biological factors on the resistance of bed-bugs (*Cimex lectularius* L.) to DDT, S. BARNES (*Bul. Ent. Res.*, 36 (1946), No. 4, pp. 419–422).—Adult bedbugs proved more resistant to DDT than nymphs; among nymphs, resistance increased with each successive instar. No difference in resistance was revealed among recently fed young ♂♂ and ♀♀; that of adult ♂♂ after 10 to 20 days' starvation was greater than for ♀♀—either gravid or virgin—starved for a similar period, but during the first 7 days' starvation virgin ♀♀ were more resistant than the gravid ones. The resistance of ♂♂ and gravid and virgin ♀♀ was lower at 24 hr. after feeding than after starvation for 5 and 3 days, respectively. Individuals kept at 30° C. were less resistant than those kept at 23° and 25°. DDT was not ovicidal, but the percentage of nymphs surviving from the sprayed eggs was small.

Methyl bromide as a delousing agent, R. LATTA, H. H. RICHARDSON, and J. B. KINDLER (*S. S. Dept. Agr. Cir.* 745 (1946), pp. 40, illus. 26).—The three methods of application of methyl bromide developed for control of body louse eggs were vault fumigation, individual bag fumigation, and pit fumigation. A demountable vault was devised and tests with this unit suggested a dosage of 9 lb. of methyl bromide per 1,000 cu. ft. of space at temperatures lower than 60°. Individual gastight fumigation bags about 25 in. wide and 50 in. long with self-contained closures were developed. Methyl bromide ampoules were broken inside the sealed bag, and the standard dosage suggested was 20 cc. per bag. Pit fumigation tests showed dosages comparable to those used in other methods to be effective, and best results were obtained with pits having small openings and covers made of gastight materials. Methyl bromide could be rapidly removed from clothing by aeration. This material

has been utilized by the armed forces in the field, at permanent delousing stations, and at ports of debarkation.

Fly and insect control with DDT, H. H. SCHWARDT. (Cornell Univ.). (*Milk Dealer*, 35 (1946), No. 7, pp. 114, 116-117).—A brief summary of tests in New York State dairy barns, using wettable sulfurs, kerosene solution, xylene emulsion, and DDT, along with "helpful hints" based on recent information with respect to DDT—its properties and toxicity—and a note on sprays in milk plants.

Concentrated sprays tested for utility in control of flies and mosquitoes, H. O. SCHROEDER, A. H. MADDEN, A. W. LINDQUIST, and H. A. JONES. (U. S. D. A.). (*Soap and Sanit. Chem.*, 22 (1946), No. 4, pp. 145, 147, 153).—The authors report on experiments in a 340,000-cu. ft. room, using finely atomized concentrated DDT sprays and an aerosol against the common malaria mosquito and the housefly; exposures were made in stationary and swinging screen cages at heights of 8 to 35 ft. and at the center, sides, and corners of the room. Dosages of 285 to 310 cc. of concentrated sprays containing 10 percent of DDT proved at least as good as 280 gm. of an aerosol containing the same DDT concentration. Best results followed application of 310 cc. of 10 percent DDT plus 20 percent of *o*-dichlorobenzene discharged over an electric fan. The findings show that use of a concentrated spray offers promise as a means of controlling mosquitoes in factories. Suggestions for practical application are presented.

[Papers on mosquitoes and their control] (*Mosquito News*, 6 (1946), No. 1, pp. 1-6, 12-16, 25-33, 38, illus. 2).—The following are included: Facts and Fallacies About DDT (pp. 1-6), Mosquitoes and Other Insects Killed by Aerial Spraying With DDT in Panama (pp. 12-13), and The Use of DDT Residual Sprays in Native Mexican Homes for Controlling *Anopheles pseudopunctipennis* Mosquitoes (p. 38), all by H. H. Stage, and DDT Applied With Hand Equipment for the Control of Salt-Marsh Mosquito Larvae, by C. B. Wisecup (pp. 14-16) (all U. S. D. A.); Effectiveness of DDT as a Residual Treatment of Bed Nets, by B. V. Travis (pp. 25-26); Bigger and Better Spraying Units, by L. E. Yettaw (pp. 27-29); Composition of DDT Products, by J. M. Ginsburg (pp. 29-31) (N. J. Expt. Stas.); and The Occurrence of *Anopheles quadrimaculatus*, *Anopheles occidentalis*, and *Anopheles walkeri* in Vermont, by R. C. Barnes (pp. 32-33).

Aedes tortilis (Theobald), a mosquito new to the United States, A. E. STAEBLER and W. F. BUREN (*Pub. Health Rpts. [U. S.]*, 61 (1946), No. 19, p. 685).—This mosquito—taken at Key West, Fla.—occurs in the Bahamas, Virgin Islands, and the Greater Antilles; it is believed possible that it may have been recently introduced by aircraft.

The larva and pupa of *Uranotaenia bimaculata* Leicester on Okinawa Shima, Ryukyu Retto (Diptera: Culicidae), L. ROTH. (Ohio State Univ.). (*Ent. Soc. Wash. Proc.*, 48 (1946), No. 3, pp. 67-75, illus. 2).—A descriptive and taxonomic study of this species of mosquito.

Guide to the insects of Connecticut.—VI, The Diptera or true flies of Connecticut—second fascicle: Family Culicidae, the mosquitoes, R. MATHE-SON. (Cornell Univ.). (*Conn. State Geol. and Nat. Hist. Survey Bul.* 68 (1945), pp. 48+, illus. 28). This second fascicle on the Diptera of Connecticut (E. S. R., 90, p. 217) considers the mosquitoes of the State, including mosquito-borne diseases and the war, bibliographical references, the structure of mosquitoes, a key to the subfamilies, tribes, and genera, and detailed treatment of the genera and species under the subfamilies Chaoborinae and Culicinae (tribes Anophelini and Culicini). An index to the species is provided.

Keys to the larval and adult mosquitoes of Espiritu Santo (New Hebrides) with notes on their bionomics, W. J. PERRY (*Pan-Pacific Ent.*, 22 (1946), No. 1, pp. 9-18).

The mosquitoes of the Kaimosi Forest, Kenya Colony, with special reference to yellow fever, P. C. C. GARNHAM, J. O. HARPER, and R. B. HIGHTON (*Bul. Ent. Res.*, 36 (1946), No. 4, pp. 473-496, illus. 9).—The danger of establishing yellow fever in certain forests of this region is pointed out; two recognized cases have been reported in recent years. The Kaimosi Forest was selected as a suitable area for study, and its general environal conditions are described. A mosquito survey was carried out over a 2-yr. period, particular attention being paid to the preference of certain species for life in the treetops. Five species were found to breed in high tree holes; four were found biting in the treetops, two of these being rare in ground catches. Detailed points of interest are presented with respect to individual species. Probably at least two trees per acre had rot holes with larvae, and about 14 percent of the *Dracaena* plants were found infested; holes in shaded granite boulders were another common source of sylvan mosquitoes. Surveys of adjacent forest areas at different altitudes revealed striking changes in the mosquito fauna. A study of lists of mammals, trees, and mosquitoes indicated that the relict forest of Kaimosi contains numerous "western" species which are not elsewhere found so far to the east. Though yellow fever is absent from this forest area, it was found suitable from every standpoint for the establishment of jungle fever, and possible measures of control are briefly suggested. Brief reference is made to other infections. Short descriptions of new species, etc., of mosquitoes are given in an appendix. There are 21 references.

Moonlight and house-haunting habits of female anophelines in West Africa, C. R. RIBBANDS (*Bul. Ent. Res.*, 36 (1946), No. 4, pp. 395-417, illus. 3).—In the huts in which they had been fed, 97 percent of the ♀♀ of *Anopheles gambiae*, *A. funestus*, and *A. melas* remained until after dawn; the last species seldom left suitable huts in the daytime. There was a high positive correlation between the time at which ♀ *A. funestus* entered huts and the time of moonlight. During moonless periods, the fighting of the ♀♀ was partially inhibited; when the moon came out the waiting mosquitoes entered the huts in greatest numbers. On moonless nights many mosquitoes waited until twilight of the following evening before entering the huts; consequently the average proportion caught in the period ending at 8 p. m. was six times greater on moonless nights than on the nights after full moon. The records for *A. melas* were less complete, and the correlation coefficient for the relation between time of entry and time of moonlight was barely significant; in view of the high significant correlations found for *A. funestus*, however, it is believed unlikely that this one is fortuitous. The essential difference between the behavior of ♀ *A. funestus* and that of *A. gambiae* is that the former flight earlier than the latter. Of the anophelines caught at 8 p. m., 58 percent were unfed, indicating that early entrants usually rest before feeding, and that average times of biting are later than average times of entry. Gravid or half-gravid mosquitoes and those containing partly digested blood failed to enter the huts. There was evidence that anophelines usually become fully gorged at one feeding; of those caught in the huts after dawn, 95 percent were fully fed.

Japanese B encephalitis virus in the blood of experimentally inoculated chickens, W. M. HAMMON, W. C. REEVES, and R. BURROUGHS. (*Univ. Calif.*). (*Soc. Expt. Biol. and Med. Proc.*, 61 (1946), No. 3, pp. 304-308).—

As a result of inoculating Japanese B encephalitis virus into chickens, the virus was frequently detected in the serum 24 hr. to 7 days later; it was also demonstrated that following the bite of four infected mosquitoes infection occurred in the one chicken used. Though these experiments do not conclusively prove that chickens may be a source of Japanese B virus infection for mosquitoes, they do indicate such a possibility. It is believed that chickens and other birds should be considered as potential sources of mosquito infection and that they deserve further study with recently isolated strains of the virus.

Chlorine as a possible ovicide for *Aedes aegypti* eggs, S. P. HATCHETT (*Pub. Health Rpts. [U. S.], 61 (1946), No. 19, pp. 683-685*).—From the data presented, it appears that newly prepared solutions of calcium hypochlorite containing 50 to 100 p. p. m. of available Cl are effective ovicides for both continuously wet and previously dried eggs of the yellow fever mosquito. Although water thus treated would be unsuitable for drinking, this procedure might have useful application for fire-protection containers, water stored in barrels to prevent shrinkage, and similar cases where water is stored for purposes other than drinking. It might also be used before dumping and replacing potable water in barrels breeding mosquitoes, to induce the eggs on the sides of the containers to hatch and then be destroyed.

Outdoor control of adult mosquitoes with DDT or pyrethrum applied with ground equipment, A. H. MADDEN, A. W. LINDQUIST, B. V. TRAVIS, and E. F. KNIPLING. (U. S. D. A.). (*Mosquito News, 6 (1946), No. 1, pp. 7-11*).—Dusts applied at rates of 0.035 to 4 lb. of DDT per acre gave good control of the adult salt marsh mosquitoes *Aedes taeniorhynchus* (Wied.) and *A. sollicitans* (Walk.), but for practical use are considered less satisfactory than sprays. Sprays applied at 0.025 lb. per acre gave nearly complete reduction of mosquitoes when atomized properly and applied in 20-ft. swaths. Similar results were obtained with sprays containing 0.75 percent pyrethrins applied at the rate of 0.004 lb. per acre. Heavy power equipment did not appear sufficiently better to warrant its use in jungle areas. The contents of a standard 1-lb. aerosol container held 8 in. from the ground and applied in the same way as dusts and sprays proved able to give 91 to 100 percent control over an acre of jungle; the aerosol was also effective against *Mansonia* spp. and *Anopheles albimanus* Wied. in Panama. DDT and pyrethrum aerosols were about equally effective. Large amounts of aerosol discharged at one point and drifted downward gave conflicting results in open areas.

Tests on the airplane application of DDT for the control of adult mosquitoes in open, unwooded areas, C. B. WISECUP, W. C. BROTHERS, and P. M. EIDE. (U. S. D. A.). (*Mosquito News, 6 (1946), No. 1, pp. 20-24*).—Large-scale tests of the effectiveness of DDT in controlling adult *Anopheles* and *Psorophora* mosquitoes were conducted during May 5-September 4, 1944, in the rice fields and pasture lands in Arkansas; 14 tests, involving over 450 acres, and using liaison-type airplanes, indicated that the abundance of *Psorophora* adults was reduced by at least 90 percent when rice fields were sprayed with 0.1 lb. or more of high-grade commercial DDT in aqueous emulsion per acre. Six-area control tests on pastures and waste lands in large open non-breeding areas indicated that technics for determining adult mosquito populations should be improved; treatments with either fuel oil or aqueous emulsion containing DDT at dosages of 0.2 to 1.0 lb. per acre are of doubtful effectiveness against adults of the malaria mosquito; light-trap collection of adult *Psorophora* spp. showed no marked differences between treated and untreated areas; landing-rate counts of *Psorophora* spp. showed marked reduction of daytime

annoyance from these mosquitoes in the treated areas; and apparently there is an extensive nighttime activity of adult mosquitoes of both *Psorophora* spp. and the malaria mosquito under conditions of open, unwooded terrain, with a heavy breeding pressure from surrounding rice fields. Under such conditions light traps and catching stations are unsuitable for evaluating differences in populations unless very large areas are to be treated.

Notes on the gapeworms (Nematoda: Syngamidae) of galliform and passeriform birds in New York State, F. C. GOBLE and H. L. KUTZ (*Jour. Parasitol.*, 31 (1945), No. 6, pp. 394-400).—The authors record and discuss in the light of the literature (80 references) their observations on gapeworm (*Syngamus trachea*) infestations in ruffed grouse, ring-necked pheasant, eastern crow, eastern robin, eastern meadowlark, and bronzed grackle.

Six new mites of the superfamily Parasitoidea, H. L. KEEGAN (*Amer. Micros. Soc. Trans.*, 65 (1946), No. 1, pp. 69-77, illus. 21).—The mites here described are *Liponyssus geomydis* n. sp. from the pocket gopher (*Geomys bursarius*); *Haemolaelaps scalopi* n. sp. from the mole (*Scalopus aquaticus*); *Euhaemogamasus sciuropteri* n. sp. from a squirrel (*Sciurus* sp.); *Entonyssus fragilis* n. sp. from the king snake (*Lampropeltis g. getulus*); *Pachysetus insculpta* n. sp. from the tipulid *Polymeda* (*Symplecta*) *cana* (Walk.); and *Pachylaelaps ornata* n. sp., host unknown.

A new mite, *Laelaps aplodontiae*, from Aplodontia, W. L. JELLISON (*Jour. Parasitol.*, 31 (1945), No. 6, pp. 373-374, illus. 1).—Several collections of mites from the mountain beaver (*Aplodontia rufa*) were found to represent the new species here described.

New use for DDT, E. T. KREBS, JR. (*Science*, 103 (1946), No. 2676, pp. 459-460).—"Scab mites" (*Psoroptes cuniculi*) on laboratory rabbits were effectively controlled by applying a 5-percent solution of DDT by an ordinary nebulizer to the inner surface of the ear.

Population studies on *Cochliomyia americana* in Arizona, C. C. DEONIER (U. S. D. A.). (*Jour. Kans. Ent. Soc.*, 19 (1946), No. 1, pp. 26-29).—Adults of the screwworm were found uniformly distributed over relatively small areas only under uniform ecological conditions. Extremely high temperatures were not a limiting factor in the development of these insects under favorable moisture relations. The presence of a larger fly population in the immediate surroundings of the host material was indicated. During hot dry weather the flies in the range sections were restricted to the vicinity of streams and mesquite draws, where moisture and shade were available. Some shifting of populations to favorable areas was observed.

The life of the queen bee, L. SUTHERLAND (*New York; Beechhurst Press*, 1946, pp. 126, illus. 24).—This volume considers in popular language the birth of the queen bee, the young queen, the worker bee, the drones, the nuptial flight, the bee and the flower, a worker bee afield, the reigning queen, working together in the hive, the queen in swarming, the massacre of the drones, the closing days of the queen, swarming—and the death of the queen, other ways of queens, beekeeping as a hobby, and the ancients and bees and includes a chapter entitled "odds and oddities."

Sur la sécrétion cireuse de l'abeille [The secretion of wax by bees], R. MOREAUX (*Compt. Rend. Acad. Sci. [Paris]*, 221 (1945), No. 20, pp. 590-592).

Feeding bees for comb production, W. WHITCOMB, JR. (U. S. D. A. coop. La. State Univ.). (*Gleanings Bee Cult.*, 74 (1946), No. 4, pp. 198-202, 247, illus. 3).—A method was devised by which colonies were fed honey continuously and frames with full sheets of foundation given at regular intervals.

In this way it was found that excellent combs partially drawn and firmly fixed to the wooden frame could be produced for 19 ct. each. During the test period—July 14–September 22, 1943—488 combs were drawn from foundation by feeding 772.5 lb. of low-grade honey or 1.58 lb. of honey for each comb produced. The average amount of wax added to each foundation was 0.188 lb.; for the four colonies the cumulative ratio of wax produced to honey consumed was 1 : 8.4. The quality of these combs was superior to those drawn by colonies during a normal flow. Although no reason for it was apparent, the efficiency of colonies in wax production increased as the test continued. In areas where it is difficult to produce good-quality combs during slow honey flows—as in many sections of the South—this method should merit attention.

On directing the flight of bees, R. G. SCHMIEDER (*Ent. News*, 57 (1946), No. 1, pp. 16–19).—A note and brief review on methods for directing the flight of bees to the flowers of particular plant species.

Some bee plants of Utah, G. H. VANSSELL. (Coop. U. S. D. A.). (*Farm and Home Sci. [Utah Sta.]*, 7 (1946), No. 1, pp. 6–7, illus. 4).—Lists are presented of the 12 plants considered as major sources of honey in the Western States and of 23 species serving as minor sources of honey or pollen. Alfalfa, the leading honey plant of Utah, is grown extensively for hay and for seed production; comments are made on several other honey sources.

A dry feeder for supplying a pollen substitute to bees, W. E. DUNHAM (*Ohio Sta. Bmo. Bul.* 239 (1946), pp. 41–43, illus. 3).—Considerable interest has been shown in the dry-feeding method for supplying a pollen substitute to bees. This brief paper discusses the advantages and disadvantages of the method, factors to consider in using it, and the preparation of the pollen substitute.

Honeybees as pollinators in the production of hybrid cucumber seed, S. W. EDGECOMB (*Amer. Bee Jour.*, 86 (1946), No. 4, p. 147).—Promising results are reported for two experiments (Iowa and Pennsylvania, 1945). Yet to be clarified are the largest number of “♀” rows that may be used to one “♂” row, the optimum time to deflorate the “♀” parent, and provision for a sufficient number of ♂ flowers on the “♂” variety to insure adequate pollen for the ♀ flowers on the “♀” variety.

A simple field test for American foulbrood; E. C. HOLST. (U. S. D. A.). (*Amer. Bee Jour.*, 86 (1946), No. 1, pp. 14, 34; also in *Bee World*, 27 (1946), No. 2, pp. 13–14).—The test is based on an enzyme produced by *Bacillus larvae* which causes the liquefaction of milk casein or curd from either reconstituted or skim milk.

ANIMAL PRODUCTION

The loss of nutrients in hay and meadow crop silage during storage, C. F. MONROE, J. H. HILTON, R. E. HODGSON, W. A. KING, and W. E. KRAUSS. (Ohio Expt. Sta., N. C. State Col., Purdue Univ., and U. S. D. A.). (*Jour. Dairy Sci.*, 29 (1946), No. 4, pp. 239–256).—From findings gathered from nearly 100 publications concerning the preservation of meadow crops as hay and as silage, the authors conclude that “well-cured” long hay, defined as that containing less than 80 percent of moisture, undergoes a storage loss of dry-matter content of from 3.5 to 9 percent; more than this in some instances. Loss of the nitrogen-free extract components was found greatest, but a loss of the ether-extract components was also indicated. From hay browned or blackened by heating due to storage at a moisture content exceeding 80 percent, losses were found to range as high as from 15 to 40 percent. Such

heating lowered the digestibility of hays, especially that of their protein content, and increased carotene losses. Some browned hays were found palatable, but the heated hays had usually lost palatability. Heating due to a given moisture content was greater in chopped than in long hay. It is held that chopped hay should contain less than 25 percent of moisture, as should hay for field baling. Salting was found not to prevent excessive heating of undercured forage. Artificially dried hay was found to suffer in storage practically negligible losses of dry matter and nutrients other than carotene. Forced ventilation mow-drying, either with or without artificial heat, usually produced hay of good quality and high feeding value. It is considered, however, that more work on the nutrient value palatability of mow-cured hay is needed. Well-cured long hay may have only one-fourth of the original carotene value after 300 days in the mow, and the carotene value may be entirely lost from heated hay.

From silage the percentage lost by top spoilage, estimated generally as from 3 to 6 percent, may be a greater proportion of the original material because of the loss of organic matter through decay and the drying out of the material. Dry-matter losses by seepage from the silo, though varying with silo size and original moisture content, are considered to be usually less than 1 percent from forage containing initially 70 percent or less of moisture. Fermentation losses per se are stated as from 5 to 10 percent. Feed analyses were found similar to those of the forage ensiled, and digestibility also similar except when lowered by heating. Some of the work cited showed a carotene retention of from 60 to 90 percent of that of the forage ensiled, but other investigations gave lower figures. Mineral acid treatment generally gave a high percentage of carotene preservation, the lowest percentages resulting from no treatment or wilting. A high silage carotene content gave high milk carotene content. The "grass-juice factor" promoting growth was found in grass silage, especially in that preserved with soured whey or with phosphoric acid. It is noted that proper moisture evaluation and control are needed for minimizing the losses in storing forages as hay and silages.

Production and utilization of silage in Mississippi, H. W. BENNETT, R. H. MEANS, W. C. COWSERT, O. A. LEONARD, and M. GIEGER. (*Mississippi Sta. Bul.* 425 (1945), pp. 23).—An extensive discussion of silage production problems with emphasis on the sorghums, Johnson grass, sweetpotatoes and sweetpotato vines, and various legumes. Data are presented on the influence of additions of molasses, phosphoric acid, and urea to ensiled material on composition and nutritive value. Methods of utilizing various silages and their relative worth for wintering beef cows and finishing steers for market and for the dairy herd also are discussed.

The nutritive value of the protein in tobacco-seed oilmeal, K. E. RAPP, J. T. SKINNER, and J. S. MCHARGUE. (Ky. Expt. Sta.). (*Jour. Nutr.*, 31 (1946), No. 3, pp. 261-271, illus. 3).—When a cold-pressed tobacco-seed oil meal containing about 30 percent crude protein and 21 percent oil was fed to rats at levels of 15 to 18 percent protein, only slow growth followed. The oil meal was proved to be deficient in lysine, but when supplemented with casein, lactalbumin, skim milk powder, or lysine, good growth was obtained. Rolled oats, corn meal, and gelatin were less satisfactory supplements to the oil meal protein. Addition of wheat gluten was no more effective than increasing the proportion of tobacco-seed oil meal so as to equalize the protein content of the two rations.

The biological values of the protein of tobacco-seed oil meal and skim milk powder when fed at a level of 10 percent were 51.4 and 78.5, respectively.

Values for true digestibility of the two in the order named were 78.0 and 96.6. The biological value of the oil meal protein when supplemented with lysine was approximately that of milk proteins. "Because of its relatively high net protein value, tobacco seed oil meal deserves consideration as a source of dietary protein."

The nutritive value of tobacco-seed oil, K. E. RAPP, J. T. SKINNER, and J. S. MCHARGUE (Ky. Expt. Sta.). (*Jour. Nutr.*, 31 (1946), No. 3, pp. 273-282, illus. 2).—Tobacco-seed oil from *Nicotiana tabacum* was analyzed and found to be free from nicotine and nor nicotine. Both temperature and surface area affected its rate of oxidation. No particular care was necessary in storing the isolated oil, but when incorporated in a ration and stored for some time refrigeration was essential.

When tobacco-seed oil was fed to rats at levels of 5, 15, and 30 percent of the respective rations, it gave an average coefficient of digestibility of 97.9 as compared with 99.1 and 98.2 for cottonseed oil and butterfat, respectively. With paired feeding of refrigerated rations containing 30 percent of tobacco-seed oil and butterfat, respectively, growth rates of rats did not differ significantly. When fed ad libitum, the difference in consumption of the two rations produced a greater rate of growth in rats fed butterfat. Of six rats fed a refrigerated ration and four animals fed a nonrefrigerated ration containing 30 percent tobacco-seed oil during the 5-week period when growth is usually maximum, all proved to be fertile upon reaching maturity.

La pulpa de cafe como alimento del ganado [Coffee pulp as a feed for livestock], F. CHOUSSY (*San Salvador: Inst. Tecnol. de El Salvador*, 1945, pp. 16, illus. 1).—Based on observations that coffee pulp is relatively rich in protein and that cows in a farm herd receiving rations high in dry coffee pulp showed no ill effects from the presence of caffeine or tannins, the Technological Institute of El Salvador conducted preliminary tests on the preparation of silage from coffee pulp and the value of such silage for milking cows. A palatable, so-called sweet type of silage resulted from adding 1 to 1½ m. of the wet pulp to the silo at a time, with 24- to 36-hr. intervals between successive additions and by providing an outlet for drainage of excess water from the mass. Such silage was palatable to milking cows and definitely improved the nutritive value of the imperfectly balanced basal ration. It is concluded that coffee pulp silage may prove to be a desirable feed which will aid in solving the difficult problem of supplying high quality animal feed in the area.

The physiology of digestion in the ruminant, A. T. PHILLIPSON (*Vet. Rec.*, 58 (1946), No. 8, pp. 81-87).—This address and accompanying discussion reviews recent literature on the subject.

The relation of the route of administration of thyroxine, thyroprotein, and intermediate products upon their utilization by ruminants, C. W. TURNER and E. P. REINEKE (*Missouri Sta. Res. Bul.* 397 (1946), pp. 20, illus. 1).—Measuring the effect of the route of administration of thyroxine, thyroprotein, and intermediate products upon their utilization by sheep by determining the decline in body weight of the assay animals during a 2-week period, it was found that the subcutaneous administration of a sample of thyroprotein was 20 times as effective as the same sample when fed. Similarly, *d,l*-thyroxine administered orally was only about one-eighth as effective as that administered subcutaneously. The administration of thyroprotein orally in dry form in a capsule was about twice as effective as when the same preparation was suspended in a slightly alkaline or in a phosphate buffer solution and given as a drench. Coating the thyroprotein particles by stearic acid, paraffin, bees-

wax, rosin, clarite, vinylite, and linseed oil in every case reduced the biological effect. Other tests indicated that the low oral biological value of thyroprotein was not due to destruction in the rumen. Acid hydrolysates of thyroprotein given as a drench gave increased biological responses when administered by mouth or directly into the abomasum. However, hydrolysis did not increase the biological value above that of the same preparation administered in a capsule. About 90 percent of the thyroxine value of thyroprotein was recovered as an acid-insoluble precipitate, but when administered orally this acid-insoluble fraction was only about 6 percent as effective as that administered by subcutaneous injection. Fairly good agreement between the biological assays and the chemical determination of the thyroxine content of thyroprotein was obtained.

A new type of glass cage for metabolism studies, K. E. RAFF, J. T. SKINNER, and J. S. MCHARGUE. (Ky. Expt. Sta.). (*Jour. Lab. and Clin. Med.*, 31 (1946), No. 5, pp. 598-599, illus. 1).—A cage constructed from a 1-gal. glass jug which permits the separation of urine and feces is described.

Range land of America and some research on its management, L. A. STODDART (*Logan, Utah: Utah State Agr. Col.*, 1945, pp. 32, illus. 4).—A brief history of the range and a review of range research at the Utah Agricultural Experiment Station, with a bibliography of 19 references.

A proposed method of measuring pasture yields with grazing cattle, R. W. KIDDER. (Fla. Expt. Sta.). (*Jour. Anim. Sci.*, 5 (1946), No. 2, pp. 187-193).—A proposed adaptation of the indirect method of measuring pasture yields with grazing cattle is described. This is based on the assumption that the average total digestible nutrient requirement for maintenance of a 1,000-lb. cow is 7.93 lb. of total digestible nutrients per day and that the average daily maintenance requirement for animals of other weights is proportional to the 0.73 power of the live weight. From this proportion the average requirement for daily maintenance of animals of any weight is calculated by the formula

$$W^{0.73}$$

culated by the formula $\frac{\text{ } }{W^{0.73}} = \text{T. D. N.}$

19.53

Applications of this method to several steer-feeding experiments are presented. Yields of grass obtained through these calculations of animal performance were found to be within the range of annual yields of grass reported by Neller and Daane (*E. S. R.*, 83, p. 49).

Progress reports: Feeding tests with sheep, swine, and beef cattle, 1945-46 (*Oklahoma Sta. Bul.* 296 (1946), pp. 46, illus. 4).—Preliminary results are presented from experiments on the following subjects: Feeding Dried Sweet Potatoes to Fattening Hogs, by C. P. Thompson (p. 3); The Utilization of Bluestem Grass in Maintaining the Commercial Cow Herd, by A. E. Darlow, V. G. Heller, W. D. Campbell, and J. C. Hillier (pp. 5-8); Protein and Mineral Supplements for Wintering Two-Year-Old Steers on Grass, by A. E. Darlow, V. G. Heller, W. D. Campbell, J. C. Hillier, and J. A. Hoefer (pp. 8-11); Vitamin A (Carotene) in Rations for Sheep and Cattle, by J. A. Hoefer, W. D. Gallup, and J. C. Hillier (pp. 12-15); Linebreeding [Farm Animals], by J. A. Whatley, Jr. (pp. 15-21); Yield and Feeding Value of Prairie Hay Cut at Different Stages of Maturity, by H. M. Briggs, W. D. Gallup, A. E. Darlow, and C. Kinney (pp. 22-24); Urea as a Partial Protein (Nitrogen) Supplement for Beef Cattle, by H. M. Briggs, W. D. Gallup, A. E. Darlow, J. C. Hillier, C. Kinney, E. Harris, D. F. Stephens, J. A. Hoefer, and W. D. Campbell (pp. 24-28); Supplements for Fattening Two-Year-Old Steers on Grass, by A. E. Darlow, V. G. Heller, J. C. Hillier, D.

Campbell, B. R. Taylor, D. Stephens, H. M. Briggs, and J. A. Hoefler (pp. 28-34); Summer Gains of Yearling Steers Wintered at Different Levels, by A. E. Darlow, V. G. Heller, D. Campbell, H. M. Briggs, J. C. Hillier, J. A. Hoefler, and D. Stephens (pp. 34-39); A Comparison of Dried Sweet Potatoes, Wheat, and Corn for Fattening Steer Calves, by A. E. Darlow, W. D. Campbell, F. B. Cross, V. G. Heller, and H. M. Briggs (pp. 39-42); and How Well Should Calves be Wintered, by A. E. Darlow, W. D. Campbell, V. G. Heller, and H. M. Briggs (pp. 43-46).

Vitamin A requirements in calves, J. M. LEWIS and L. T. WILSON (*Jour. Nutr.*, 30 (1945), No. 6, pp. 467-475, illus. 2).—Calves 2 to 9 days old were placed on a vitamin A-low diet to deplete their stores of this vitamin. When weight gains had ceased, they were divided into six groups of four calves each and fed levels of vitamin A ranging from 32 to 1,024 U. S. P. units per kilogram of body weight per day.

Results were similar to those previously observed with rats (E. S. R., 88, p. 707) and infants (E. S. R., 83, p. 849).

The minimum requirement for calves was about 32 units per kilogram. At this level, growth was fair, and practically no signs of night blindness were noted; however, blood levels of vitamin A were low, and there was little or no liver storage. Maximum growth occurred when the level was raised to 64 units, but maximum concentration of vitamin A in the blood did not appear until 512 units were fed.

Liver storage of vitamin A was variable; practically no storage occurred with the feeding of 64 units or less. Liver stores were low in calves receiving up to 128 units, moderate when the vitamin A level was 256 and 512 units per kilogram per day, and high when the level was 1,024 units.

The authors conclude that "from the standpoint of both growth and liver storage, the daily intake of vitamin A for young calves should be about 250 U. S. P. units per kilogram of body weight or 11,000 units per 100 lb. of liver weight."

[Sheep husbandry in Great Britain] (*Jour. Roy. Agr. Soc. England*, 106 (1945), pp. 166-203).—Under the title of Crossbreeding of Sheep (pp. 166-184), T. L. Bywater gives a brief survey of current breeding problems. Hill Sheep Problems are discussed (pp. 185-203), M. Griffith dealing with the Welshman's view, A. R. Wannop with problems of the Highlands of Scotland, and H. C. Pawson with the improvement of enclosed areas.

Starting right with sheep, W. M. TELLER (*Noroton, Conn.: Ed. Robinson's "Have-More" Plan*, 1945, pp. 40+).—This is a popular manual for the beginner.

Body temperature and respiration rate, and their relation to adaptability in sheep, J. C. MILLER and L. MONGE (Univ. Tenn. et al.). (*Jour. Anim. Sci.*, 5 (1946), No. 2, pp. 147-153, illus. 2).—Body temperature and respiration rate determinations were made on six uniform breed groups of five ewes each in the summer of 1943 and on seven groups in 1944. Purebred groups consisted of Southdown, Hampshire, Merino, and Rambouillet. Crossbred groups consisted of Southdown × Rambouillet, Dorset × Rambouillet, and Suffolk × Rambouillet. Determinations were made at different hours of the day from 8 a. m. to 5 p. m. on each ewe, and average values for each breed group were used for comparisons. Atmospheric temperature and relative humidity recordings were made.

With few exceptions Southdown and Hampshire groups in that order showed the highest body temperature and respiration rate at all hours of the day. Rambouillet and Merino groups were quite comparable on body

temperature and respiration rate, and somewhat lower than the Southdown and Hampshire groups. The crossbred groups had lower respiration rate than the purebred groups, but their body temperature was quite comparable to that of the fine wool breeds (Merino and Rambouillet).

Body temperature and respiration rate in purebred groups were influenced more by atmospheric temperature changes than in the crossbred groups, Suffolk $\times$ Rambouillet ewes maintained the lowest respiration rate of all groups at all times and were least affected by atmospheric temperature changes. They also maintained a relatively low body temperature which fluctuated very little with atmospheric temperature changes. Merinos showed the lowest body temperature and respiration rate, and the least daily fluctuation among purebred groups.

The correlation between thermoregulatory efficiency and flock record is deemed more than a coincidence.

The influence of high-protein and low-protein high-starch diets on blood glucose and acetone bodies of pregnant ewes, J. C. SHAW and F. C. DAUGHERTY. ([Conn.] Storrs Expt. Sta.). (*Jour. Anim. Sci.*, 5 (1946), No. 2, pp. 180-186, illus. 1).—Two groups of four pregnant mature Dorset ewes each were maintained on a low-protein diet for approximately 100 days prior to parturition. Neither hypoglycemia nor ketonemia developed during the period of pregnancy even when the energy intake was limited to 50 percent of requirements, but a mild hypoglycemia was noted following parturition in both these groups and two similar groups which had received high-protein rations.

Fattening lambs in Montana, R. T. CLARK, R. R. WOODWARD, and D. HANSEN. (Coop. U. S. D. A.). (*Montana Sta. Bul.* 433 (1945), pp. 34, illus. 3).—The results of 16 separate lamb-feeding trials are summarized. In a comparison of grains, oats consistently gave better results than hard or soft wheat, barley, or corn, with very little difference in the effectiveness of these other grains. Protein and mineral supplements failed to improve the effectiveness of a ration of grain, wet beet pulp, and good alfalfa hay. Self feeding a ration of equal parts of oats, dried molasses-beet pulp, and chopped alfalfa proved to be a desirable practice and is particularly recommended where hay prices are relatively high. While dried beet pulp and wet pulp proved to be the most desirable beet byproducts, beet tops and beet top silage proved to be satisfactory feeds for lamb fattening. Alfalfa hay produced slightly cheaper gains than native hay plus a protein supplement, although the latter resulted in slightly higher gains.

Dehydrated potatoes and alfalfa silage for lambs, A. L. ESPLIN and W. E. CONNELL (*Colo. Farm Bul.* [Colorado Sta.], 8 (1946), No. 2, pp. 3-4, 5, 6-9, illus. 4).—In a single test with 11 lots of 20 lambs each and covering 84 days, dehydrated potato cubes proved surprisingly good, both when fed by themselves and in grain mixtures, and were superior to dehydrated shredded potatoes. Alfalfa-acid silage ranked with, or better than, corn silage and wet beet pulp produced good and cheap gains. Sulfur fed in a grain mixture in a concentration of 2 percent reduced grain consumption and greatly increased the cost of gains.

Pigs: Their breeding, feeding, and management, V. C. FISHWICK (*London: Crosby Lockwood & Son*, 1946, 2. ed., rev., pp. 222, about 50 illus.).—This revision (E. S. R., 82, p. 523) incorporates more recent information and adds a chapter on costs and returns.

Nicotinic acid and the level of protein intake in the nutrition of the pig, M. M. WINTROBE, H. J. STEIN, R. H. FOLLIS, JR., and S. HUMPHREYS. (U. S.

D. A. et al.). (*Jour. Nutr.*, 30 (1945), No. 6, pp. 395-412, illus. 3).—A detailed study has been made on 61 pigs showing the influence of various vitamin supplements, with and without nicotinic acid, upon the effects of high or low protein diets. The standard basal diet previously described (*E. S. R.*, 88, p. 799) was used. In the high protein diet, 26.1 percent crude casein was fed, while the low protein diet contained only 10 percent.

Young pigs fed a high protein diet supplemented with thiamine, riboflavin, pyridoxine, choline, and pantothenic acid showed no signs of nutritional deficiencies with the exception of slightly lower growth rates in certain instances. The addition of inositol and p-aminobenzoic acid produced no significant changes. The addition of nicotinic acid seemed to increase the average growth rate to some extent.

On a low protein diet (10 percent casein), the omission of nicotinic acid alone produced characteristic signs of nutritional deficiency (greatly impaired growth, rough coats, diarrhea, loss of appetite, and severe anemia). In these animals, a marked and consistent reduction was noted in the urinary excretion of nicotinic acid derivatives.

A discussion of the close nutritional relationship between protein and nicotinic acid metabolism is presented. Thirty-eight references are cited.

The effects of a vitamin B mixture, of level of protein, and of proportion of protein of animal origin in the supplements to barley and to wheat in the bacon hog ration, E. W. CRAMPTON and G. C. ASHTON (*Sci. Agri.*, 26 (1946), No. 1, pp. 43-49).—A feeding trial involving 128 Yorkshire pigs was carried on to determine the comparative effects of various factors on carcass quality when wheat or barley was the basal feed. The following conclusions were drawn:

"Season may be an important factor in the excellence of bacon carcasses produced. If pigs are finished in winter in cold pens the rate of gain may be sufficiently reduced to result in a superior carcass. Carcasses from male pigs are by nature fatter than those from females. The tendency for wheat as compared to barley to damage carcass excellence is more pronounced with male than with female pigs. Special supplementation with a mixture of thiamine, riboflavin, and niacin tended to aggravate the already greater tendency of wheat than of barley to produce fat carcasses. Reduction of the protein level of the ration from 15 percent to 13 percent was reflected in lower feed intake and slower gains, but did not affect carcass excellence regardless of whether wheat or barley was the basal feed. Halving the proportion of the protein from animal origin had no measurable effect either on the progress of the live pigs or on the excellence of the carcasses. Apparently 1.4 percent of protein of animal origin in the ration—equivalent to only 9 percent of the protein of a ration carrying 15 percent protein—is as satisfactory as is double this amount."

The relative anti-rachitic potency of irradiated ergosterol (D_2) and irradiated 7-dehydrocholesterol (D_3) for growing pigs, E. W. CRAMPTON and G. C. ASHTON (*Sci. Agri.*, 26 (1946), No. 1, pp. 16-24, illus. 1).—The tests reported were undertaken with the specific object of comparing the effectiveness of vitamin D_2 and D_3 in preventing rickets in pigs placed on rachitic diets at a weaning age of about 56 days. In no case, however, did rickets develop, so that "these tests offer no basis for a comparison of the anti-rachitic potency for swine of vitamin D_2 or D_3 ." It is thought that when weaned at 8 weeks from mothers which during pregnancy and lactation have received daily about 15,000 International Units of vitamin A and 3,000 I. U. of vitamin D, young pigs confined indoors have a considerably lower vitamin D requirement than

present standards call for if their diets contain at least 0.57 percent P; the Ca : P ratio is not wider than 0.5 : 1; and bone ash values of the order of 57 percent, and normal trabecula, are taken as indicating normal bone metabolism.

Biotin deficiency syndrome in pigs fed desiccated egg white, T. J. CUNHA, D. C. LINDLEY, and M. E. ENSMINGER. (Wash. Expt. Sta.). (*Jour. Anim. Sci.*, 5 (1946), No. 2, pp. 219-225, illus. 4).—A biotin deficiency was produced in two pigs by feeding 30 percent of desiccated egg white in the ration. The deficiency symptoms included alopecia, spasticity of the hind legs, cracks in the feet, and a dermatosis of the skin characterized by dryness, roughness, and a brownish exudate. This syndrome was prevented by intramuscular injection of 100 μ g. of biotin per pig per day. The deficiency resulted in 50 percent more feed being required per pound of gain and a decrease of 45 percent in rate of daily gain.

The effect of fineness of grinding on the utilization of oats by market hogs, E. W. CRAMPTON and J. M. BELL (*Jour. Anim. Sci.*, 5 (1946), No. 2, pp. 200-210, illus. 4).—When pigs of 50 lb. initial weight were fed on coarse, medium, or finely ground oats, adequately supplemented by proteins and minerals, significantly faster gains were obtained as the modulus became finer. Pigs fed coarse, medium, and fine modulus reached 121, 132, and 155 lb. live weight, respectively, in 60 days of feeding. Feed consumption over the 60-day growth period increased as the modulus became finer, but this was due almost entirely to the increased size of pig because of faster growth rates. Pigs of equal size ate approximately equal amounts of feed daily. Fibrous portions made up largely of hulls were decidedly unpalatable to the younger pigs, and unless they were finely ground they were sorted out and refused. Grinding oats to various degrees of fineness did not affect the extent to which the older pigs digested the dry matter, and when the young pigs were unable to separate the hulls, because of fine grinding, no age differences were noted in dry matter digestibility. The importance of considering feed refusals in the evaluation of a ration is discussed, as is also the possibility of a factor, or factors, contained in oat hulls which affects nutrient utilization.

Cull peas as a protein supplement for fattening hogs, W. M. BEESON and C. W. HICKMAN (*Idaho Sta. Cir.* 105 (1945), pp. 4).—Tests comparing various combinations of meat meal and ground cull peas in the protein-mineral supplement fed free choice with rolled wheat to fattening pigs in dry lot led to the conclusion that ground cull peas make an excellent protein supplement for fattening hogs if properly balanced with a small amount of meat meal. A mixture composed of meat meal, 10 lb.; ground peas, 57 lb.; ground alfalfa, 25 lb.; oystershell, 4 lb.; steamed bonemeal, 2 lb.; and salt, 2 lb., was the most satisfactory ration tested. It gave as good results as one containing 50 percent meat meal and was superior to one containing only 5 percent meat meal. Field peas were not satisfactory as the only protein concentrate in the ration.

The value of shark meal in swine rations, S. P. MARSHALL and G. K. DAVIS. (Fla. Expt. Sta.). (*Jour. Anim. Sci.*, 5 (1946), No. 2, pp. 211-218, illus. 1).—In a 16-week test by the paired-feeding method, the ration containing shark meal as the principal source of protein produced growth in pigs comparable to that in pigs receiving roller process dried skim milk. The average growth of the pigs exceeded that shown by the Ittner and Hughes standard growth curve for swine (E. S. R., 81, p. 93). Even in rations which contained 5.9 to 13.98 percent of this new protein supplement, the shark meal did not produce any off- or fishy flavor in the lean or fat of the animals.

Factors affecting farm horse power, R. S. HUDSON and B. GOOD (*Michigan Sta. Quart. Bul.*, 28 (1946), No. 3, pp. 208-215, illus. 2).—This phase of the study dealt with the possibility of lower costs in producing horses of light and heavy types. It is concluded that colts can be raised to maturity more profitably out-of-doors on pasture during the summer and from uncut meadows and stacked hay during the winter. Colts can be so raised without sacrifice in final weights, and as compared with housing in single and box stalls had better legs and feet. Colts receiving grain the first winter as weanlings had greater resistance to distemper than those wintered on hay and pasture. When developed on roughage they were not in ready condition for sale as yearlings or 2-year-olds, but "at present low prices for draft horses the cost of producing them is more likely to be under the selling price."

Blood and tissue chemical studies in fowl, G. R. HERRMANN (*Soc. Expt. Biol. and Med. Proc.*, 61 (1946), No. 3, pp. 229-230).—Normal blood and tissue levels of the usual organic constituents, with special reference to total cholesterol and cholesterol esters and other lipids, were determined as a basis for contemplated fat metabolism studies.

The utilization of food elements by growing chicks.—X, A comparison of open-pollinated and hybrid corn in a ration for growing chicks, C. W. ACKERSON, W. E. HAM, and F. E. MUSSEHL (*Nebraska Sta. Res. Bul.* 144 (1946), pp. 5).—The effect of replacing open-pollinated corn with hybrid corn in an otherwise complete ration was studied in a growth and body analysis experiment with two lots of newly hatched chicks fed identical amounts of the pelleted rations. At the end of a 6-week feeding trial, there were significant differences in the growth rate of the chicks in favor of the lot fed open-pollinated corn.

The effect of the pantothenic acid content of eggs on the amount in newly hatched chicks, P. B. PEARSON, V. H. MELASS, and R. M. SHERWOOD. (*Tex. Expt. Sta. and Tex. A. & M. Col.*). (*Arch. Biochem.*, 7 (1945), No. 2, pp. 353-356).—Hens were fed rations containing 3.9, 8.6, and 15.7 μg . of pantothenic acid per gram of diet. Assays were made on the eggs laid by these hens and on the entire chick at the time of hatching. Results showed that the amount of pantothenic acid in the egg was dependent upon the diet, and that no change occurred during incubation prior to hatching. The pantothenic acid values found in the egg and the newly hatched chick were, respectively, 4.9 and 5.2, 7.9 and 8.3, and 14.0 and 13.6 μg ./gm. for the three levels of vitamin fed the hen.

New Jersey egg-laying tests, 1916 to 1943: Production and mortality of White Leghorn, Rhode Island Red, and Barred Plymouth Rock pullets, C. S. PLATT (*New Jersey Stas. Bul.* 720 (1945), pp. 24, illus. 3).—A study of the records of 29,714 White Leghorn, 4,948 Rhode Island Red, and 3,002 Barred Plymouth Rock pullets entered in the New Jersey egg-laying tests of Vineland, Passaic County, and Hunterdon County from 1916 to 1943 indicated an increase in production on the part of the respective breeds of 46.0, 93.3, and 67.2 eggs annually per bird entered. Winter egg production showed the greatest gain over the years, and occurred without any lowering of spring or summer production. Most of the improvement is attributed to changes in management resulting from the practice of earlier hatching, the more careful selection of pullets for entry, the use of artificial light, and the shifting of the months of operating the tests from November to October, inclusive, to October to September, inclusive. Mortality in all three breeds exhibited a tendency to increase during the first few years of the operation of the tests,

or from 1916 to approximately 1980. After 1980 there was a gradual decline, with considerable variation from year to year.

Artificial control of egg production, G. O. HALL. ([N. Y.] Cornell Expt. Sta.). (*Farm. Res. [New York State and Cornell Stas.]*, 12 (1946), No. 2, pp. 17-18, illus. 1).—In this study restricted feeding, and restricted feeding combined with restricted lighting, were tested as means for the artificial control of egg production during the summer months and the effects of such controls on fertility, hatchability, and egg production during the fall months. Three pens of 30 birds each of high-producing 2-year-old Single-Comb White Leghorns were used each year over a 3-yr. period. Observations were taken over three periods of 7 mo. each from June 1 to January 31, during the years 1943 to 1946. Records were kept of changes in body weight, molting, feed consumption, egg production, fertility, and hatchability.

In pen A, restricted feeding, and pen B, restricted feeding and lighting, there was a marked decline in body weight. In pen A the molt was slow and erratic, in pen B it was both rapid and complete, and in pen C, the control, there was little or no molting until relatively late in the fall. Mortality was relatively high in all pens, but lowest in pen B.

Egg production was significantly lower in pen A, as compared with the other two groups. In 2 of the 3 yr. the birds in pen B produced more eggs than did those in the control group. Also, the birds in pen B produced more eggs during months of high egg prices. The value of the eggs from pen A as compared with the control indicated that restricted feeding alone is not a satisfactory procedure for the artificial control of the distribution of egg production, and that it is not economically sound if based entirely on the market value of eggs.

The average infertility for all treated pens during the 3 yr. was 24.7 percent, and for the control pens 47.3 percent. Percentage hatchability of both total eggs and fertile eggs was significantly higher in the treated pens than in the control. Owing to lower infertility, higher hatchability, and very much higher egg production during the period from September 1 to January 31, the number of chicks from pen A was double the number from the control, and from pen B slightly more than three and one-half times the number from the control.

The results indicate that it is possible to control egg production artificially during the summer months, and that such control may be used as a means of greatly increasing the number of fall chicks which may be hatched from hens. "This makes possible the hatching of chicks from hens during the fall for research purposes, or where there is a demand for fall chicks from hens it may materially increase economic returns."

The effect of artificial light on egg production of late hatched White Leghorn pullets, J. E. PARKER (*North Dakota Sta. Bimo. Bul.*, 8 (1946), No. 4, pp. 15-18, illus. 1).—A group of 67 late-hatched White Leghorn pullets, which were exposed to artificial lights so as to provide 14 hr. of total light per day commencing October 19, laid 64 eggs per bird to February 7, whereas a similar group of 67 unlighted pullets laid 47 eggs. The percentages of egg production were 57 and 42, respectively. For the entire 48 weeks of the experiment the average egg production was 199 for the lighted pen and 181 for the unlighted pen, and the percentages of production for the two pens were 59 and 54, respectively. The use of artificial lights had little influence on mortality rate, body weight, egg weight, intensity of egg production, or persistency, and the increase in production was due largely to a hastening of sexual maturity. Feed consumption per bird was higher in the lighted pen,

but the amount of feed to produce a dozen eggs was less than in the unlighted pen.

Annual molt in Rhode Island Reds, F. A. HAYS and R. SANBORN (*Massachusetts Sta. Bul.* 429 (1945), pp. 24, illus. 4).—Molting behavior in its relation to first-year egg production was studied in seven generations of Rhode Island Reds. A comparison was made between stocks bred for exhibition color and stocks bred for high fecundity. Both males and females were included in the study and all records were made on the first annual molt. Observations were taken at biweekly intervals beginning in the last week of July and extending through the month of December.

Molting behavior was more consistent in the 10 wing primary feathers than in 5 other feather tracts studied. The time of onset of wing primary molt had a significant effect on first-year egg production, and date of completion of wing primary molt was probably the most important consideration from the standpoint of antecedent egg production. Birds bred for high fecundity had the ability to lay for a considerable period after wing molt began, and superior layers did not usually stop laying until three or more primaries had been lost. Males and females bred for high fecundity completed their annual molt later than stock bred for exhibition color. Males usually completed their molt more than a month earlier than females. A decline in body weight during annual molt was characteristic of exhibition males and females. Males bred for production did not exhibit this decline, but females showed a slight decline at the height of the molt.

Evidence was inconclusive that selective breeding can increase the length of the laying period during wing primary molt. There was evidence, however, that the date of completion of molt is governed by inheritance. Hatchability during the second laying year may be reduced by extremely long periods of molt as well as by a very late termination of molt.

Percentage of edible meat in relation to meat type score of chickens, E. W. HENDERSON (*Michigan Sta. Quart. Bul.*, 28 (1946), No. 3, pp. 176-180, illus. 1; also in *Amer. Egg and Poultry Rev.*, 7 (1946), No. 4, pp. 44, 46, illus. 1).—Supplementing a previous study of scoring systems (E. S. R., 94, p. 516), mathematical proof of a valid relationship between the meat type score of live and dressed chickens and the percentage of edible meat is presented by means of calculated significant correlation coefficients. The correlation between dressed meat type score (range 1-5) and the percentage edible meat was -0.62 and that for live meat type score -0.48 . Selection methods for improving meat type by breeding are discussed.

Starting right with turkeys, G. T. KLEIN, edited by E. ROBINSON (*New York: Macmillan Co.*, (1946), pp. 129+, about 100 illus.).—This popular treatise by the extension poultry husbandman at the Massachusetts State College deals with the growing and utilization of turkeys, especially on a small scale.

DAIRY FARMING—DAIRYING

Effect of warm weather on grazing performance of milking cows, D. M. SEATH and G. D. MILLER. (La. Expt. Sta.). (*Jour. Dairy Sci.*, 29 (1946), No. 4, pp. 199-206).—Observations on three Jersey and three Holstein milking cows during early September in 1945 at Baton Rouge, La., are reported.

Cows showed a progressive rise in body temperature throughout the day. When they left the milking barn at 5:45 a. m. it averaged 101.7° F.; upon entering the shade of trees at 9:20 a. m. it was 102.4° ; after a period of 1

hr. in the shade, 102.6°; at 2 p. m., 103.3°; and upon entering the milking barn at 3 p. m. it was 103.5°. During these same respective periods respiration rates were 63, 64, 71, 78, and 79 per minute. Atmospheric temperatures during these periods increased from 73° at 5:45 a. m. to a high of 86.7° at 2 p. m.

Observations of 24-hr. grazing periods showed that during 2 relatively warm days cows grazed less than 2 hr., 1.9 and 1.8 hr. during daytime (between a. m. and p. m. milking periods), but grazed three times as much, 5.7 and 5.5 hr., at night (between p. m. and a. m. milking). Data on 2 cool days showed daytime grazing 2.4 times as great as for warm days, and 24-hr. grazing totals more than 1 hr. longer than for warm days.

The number of grazing periods averaged 1.4 for daytime and 2.7 for night. Cows seldom had but one important grazing period during the daytime. Three grazing periods were the most common at night and the time spent grazing averaged 5.5 hr., while 3.5 hr. were spent lying down and 0.7 hr. standing without grazing. "Results of the study suggest the need for good pasture at night and, especially on warm days, an excellent daytime pasture. There appears to be a need for experimental trials to test the best method of providing supplemental feed to cows during their long periods in shade during warm summer days, and to determine the best methods for making them more comfortable during this same period."

See also an article by Atkeson et al. (E. S. R., 88, p. 671).

Simple versus complex grain mixtures in dairy rations.—II, Summer feeding to milking cows on pasture, C. F. MONROE and W. E. KRAUSS (*Ohio Sta. Bimo. Bul.* 239 (1946), pp. 31-35, illus. 1).—The comparison of simple v. complex grain mixtures for winter feeding previously noted (E. S. R., 95, p. 98) has been extended to summer feeding with 56 cows on pasture. In two successive pasture seasons a simple grain mixture containing ground shelled corn and soybean oil meal was compared with one containing corn, oats, bran, linseed oil meal, and soybean oil meal. Performance, as measured by production, live weight gains, and persistency of production was similar on both mixtures. "Inasmuch as the cows used produced at a high level (milked three times daily) and the trials were continued throughout the pasture season, it is felt that when adequate pasture is available and supplementary roughage is fed, satisfactory performance can be expected on simple grain mixtures."

Methods of making potato silage and tests of its feeding value for dairy cows, J. B. SHEPHERD, T. E. WOODWARD, and C. G. MELIN (*U. S. Dept. Agr., Tech. Bul.* 914 (1946), pp. 13).—Comparing the keeping quality, palatability to milking cows, and effects on milk production of potato silage prepared in various ways, it was found that the best silages were obtained when potatoes were ensiled with 15 to 22 percent of added hay or other dry forage. These silages were similar in appearance to good grass silage but somewhat heavier. They were consumed in large quantities by dairy cows which made good gains in live weight and maintained milk production. Also, such silage had no undesirable effect on composition and quality of the milk. Ensiling potatoes alone, or with 3 percent of corn meal, or with 0.75 percent of salt did not prove practical. Such silages were heavy, soft, and mushy, and hard to handle, and lost an excessive amount of nutrients through drainage of juice. They were moderately palatable to cows, but when consumed exerted an undesirable effect on the quality of milk, particularly by depressing the percentage of fat with resulting high iodine values and low saponification values in the milk.

Raw chopped potatoes were eaten readily and compared favorably with corn silage insofar as live weight and milk production was concerned. Also, the composition of milk was unaffected, although the milk developed some off-flavors. It is concluded that when the quantity of potatoes available for feeding is small they can be fed to best advantage in the fresh raw state. When the quantity is large they can be preserved satisfactorily as silage and fed over a longer period of time. For best results they should be ensiled with 20 to 25 percent of good quality hay or other dry forage.

The therapeutic effect of yeast and pyridoxine on poikilocytosis in dairy cattle, J. T. REID, C. F. HUFFMAN, and C. W. DUNCAN. (Mich. State Col.). (*Jour. Nutr.*, 30 (1945), No. 6, pp. 413-423).—Poikilocytosis was found to be most common in cows with large open fistulas of the rumen and in young calves fed a restricted diet (whole milk and breakfast cereal). The blood picture was similar to that noted previously (E. S. R., 93, p. 770). Treatment of the affected animals with nicotinic acid, riboflavin, or a mineral mixture containing Fe, Cu, Co, and Mn had no influence on the progress of the disease.

The feeding of dried brewers' yeast or live yeast effectively ameliorated the disease within 3 to 4 weeks. The substitution of 5 to 20 mg./day of pyridoxine produced a slow recovery, while the ingestion of 40 mg. of pyridoxine daily produced complete recovery and normal erythrocyte formation in 3 to 4 weeks.

As normal cattle are considered to be able to synthesize pyridoxine in the rumen, the authors suggest, from the results noted above, that the "primary defect responsible for the occurrence of poikilocytosis in dairy animals is due to a lack of, or an interference with, normal ruminal activity."

The effect of the prepartum diet of the cow on the vitamin A reserves of her newborn offspring, G. H. WISE, M. J. CALDWELL, and J. S. HUGHES. (Kans. Expt. Sta.). (*Science*, 103 (1946), No. 2681, pp. 616-618).—Feeding vitamin A at the rate of a million U. S. P. units daily to individual dairy cows in the later stages of gestation augmented significantly the vitamin A concentration in the blood and the livers of their four newborn calves, but pasture grazing, providing an abundance of carotene in the prepartum diet of the dams failed to effect an increase over that observed in eight calves from dams restricted to a standard winter ration. The explanation for these divergent results is deemed obscure, but it is suggested that the placental membrane may be more permeable to the ester form of vitamin A than to the alcohol form. "This high initial vitamin A reserve in the newborn calf should have practical value in the maintenance of its postnatal health."

Controlled experiments on the value of supplementary vitamins for young dairy calves, C. L. NORTON, H. D. EATON, J. K. LOOSLI, and A. A. SPIELMAN. (Cornell Univ.). (*Jour. Dairy Sci.*, 29 (1946), No. 4, pp. 231-238, illus. 1).—Studies are reported involving approximately 60 heifer calves of various dairy breeds, largely Holsteins, which showed that supplementing a normal diet with capsules or tablets containing vitamins A, D, and E, ascorbic acid, and several of the B-vitamins did not reduce the incidence or severity of scours. Extra vitamins in the amounts fed had no certain effect on the rate of growth or the general appearance of the calves during the early months of life. Under the feeding and management conditions involved, there was no advantage to calves from adding extra vitamins to the normal ration.

Tests show young calves need butterfat, T. W. GULLICKSON and J. B. FITCH (*Minn. Farm and Home Sci. [Minnesota Sta.]*, 3 (1946), No. 2, pp. 12-13, illus. 2).—Tests with calves about 2 weeks old resulted in much poorer physical condition for those receiving homogenized vegetable oils. The calves

fed tallow, lard, or hydrogenated vegetable oils made almost as satisfactory gains in weight as those receiving milk fat, and were on the whole quite thrifty and healthy, although somewhat inferior in appearance and less fat was deposited in their carcasses. The calves fed coconut oil and peanut oil were on the whole inferior in condition to those fed lard, tallow, and hydrogenated vegetable oils, but definitely superior to animals fed the other vegetable oils.

The average daily gains in weight for the groups for ages up to 90 days were as follows: Butterfat 1.3 lb.; tallow, lard, and hydrogenated vegetable oil 1.2; coconut oil 0.96; peanut oil 0.80; corn oil 0.40; soybean oil 0.32; and cottonseed oil 0.31 lb.

Secretion of milk. D. ESPE (*Ames, Iowa: Collegiate Press, 1946, 3. ed., pp. 314+, illus. 62*).—The third edition of this book follows the same general plan of subject matter presentation as the second edition (E. S. R., 87, p 105). The bibliography has been extended to include 1,294 citations.

Studies of the carbohydrate metabolism of mammary gland tissue in vitro, II-III. C. B. KNOTT and W. E. PETERSEN. (*Minn. Expt. Sta.*). (*Jour. Dairy Sci.*, 29 (1946), No. 2, pp. 115-128).—These two papers deal, respectively, with work on tissue slices prepared and incubated in accordance with the method described in paper I (E. S. R., 93, p. 488) of the series, and citric acid determined by the Pucher, Sherman, and Vickery method (E. S. R., 76, p. 585); and with experiments on the isolated and perfused bovine gland.

II. *The metabolism of citric acid and β -hydroxybutyric acid in tissue slices* (pp. 115-120).—It is shown that the mammary gland can synthesize citric acid from substances in the tissue. Addition to the slices of glucose, lactic acid, pyruvic acid, maltose or glycogen increased citric acid formation, indicating that these substances may serve as precursors. When large proportions of citric acid were added, its degradation during incubation was observed. Increments in added β -hydroxybutyric acid were used in increasing quantities by the incubated tissue slices. Part of the added β -hydroxybutyric acid is converted into acetone and acetoacetic acid, the quantity thus changed decreasing with increased concentration and use. Conversion of β -hydroxybutyric acid into citric acid by the mammary gland is considered questionable.

III. *Glycogen as an intermediary in the formation of lactose* (pp. 121-128).—In paper III, the results of a series of 17 perfusion experiments are reported. The effects of insulin upon lactose formation and tissue glycogen storage were studied. The effects of insulin administered in a series of 5 experiments were compared with the results in 5 experiments in which insulin was omitted but glucose was added to maintain normal or subnormal blood levels. In 7 experiments the effect of large additions of glucose, together with insulin, was studied.

Administration of 120 to 160 units of insulin markedly reduced the percentage of lactose in the milks even though the bloods contained adequate amounts of glucose for normal lactose production. The accumulation of tissue glycogen was greater in the insulinized glands than in the controls. The evidence obtained is held to indicate that the increase in tissue glycogen was not due to glycogenic properties of insulin but more likely to its blocking of glycogenolysis. It is believed that lactose is formed from degradation of glycogen, and the lowered lactose production in experiments where insulin was administered is accounted for by a blockage of glycogen breakdown.

Lactic acid, pyruvic acid, amino acids, acetone bodies, oxygen, carbon dioxide, and hemoglobin in arterial and mammary venous bloods of cows

under various physiological conditions, J. C. SHAW. ([Conn.] Storrs Expt. Sta.). (*Jour. Dairy Sci.*, 29 (1946), No. 4, pp. 183-197).—The respiratory quotient of the active mammary glands of both normal and fish-oil-fed cows under nembutal anesthesia exceeded unity, with mean values of 1.27 and 1.81, respectively. In experiments with nonanesthetized cows in which the percentage of fat and the low fatty acids of milk fat had been depressed by feeding fish oil, the respiratory quotient exceeded unity in 9 of the 15 experiments, with a mean quotient of 1.16. On the basis of these data, the suggestion that a metabolic relationship exists between the respiratory quotient of the gland and the synthesis of the lower fatty acids of milk is regarded as still in doubt.

Numerous experiments on cows under anesthesia confirmed the earlier report of Powell and Shaw (E. S. R., 90, p. 243) that the mammary gland does not utilize a significant amount of blood lactic acid. The mean arteriovenous value for 22 experiments was +0.18 mg. percent. The mean arteriovenous difference for pyruvic acid in 26 experiments was +0.047. Consequently, blood pyruvic acid appears to be of little significance in the metabolism of the active mammary gland.

The arteriovenous differences of lactic acid and pyruvic acid were not altered significantly on fish-oil-fed, fasted, or nonlactating cows from that observed on normal lactating cows. Neither the utilization of amino acids nor acetone bodies were altered significantly by depressing the percentage milk fat and the lower fatty acids by feeding fish oils. Arteriovenous hemoglobin studies on anesthetized cows confirmed earlier observations that little or no arteriovenous change occurs in unagitated cows. The percent hemoglobin difference for 42 experiments on anesthetized cows was 0.40 and exceeded 1 percent in only 5 cases.

The distribution pattern of fatty acids in glycerides of milk fat, E. L. JACK, J. L. HENDERSON, and E. B. HINSHAW. (Univ. Calif.). (*Jour. Biol. Chem.*, 162 (1946), No. 1, pp. 119-128).—The authors present data showing the fatty acid composition, the percentage of fully saturated glycerides, and the fatty acid composition of the fully saturated glycerides of milk fat fractions separated from the solvent. The mole percentage of fully saturated glycerides found was as follows: —7° precipitate 75.4 percent, —13° precipitate 40.5 percent, —23° precipitate 40.3 percent, —53° precipitate 25.8 percent, —53° filtrate 4.6 percent, and original milk fat 31.3 percent. Acids in milk fat tend to be distributed among the glycerides as widely as possible. Patterns for the distribution of the fatty acids among the glycerides in the different fractions, based on the supposition that the fatty acids are distributed as widely as possible, are postulated. The hypothetical patterns are compared with the experimental data.

The rate of autoxidation of milk fat in atmospheres of different oxygen concentration, P. S. SCHAFFER, G. R. GREENBANK, and G. E. HOLM. (U. S. D. A.). (*Jour. Dairy Sci.*, 29 (1946), No. 3, pp. 145-150, illus. 3).—The authors obtained data indicating that an autoxidation of milk fat by which it is combined with as little as 0.8 percent by volume of oxygen is enough to render the fat inedible. It is pointed out that in the atmosphere of a container of dried milk this is equivalent to 0.20 percent of oxygen; and that so low a level of oxygen concentration is difficult to attain even by "regassing" procedures. Studies of the relative keeping quality of samples of milk fat and samples of a dried milk in atmospheres of different oxygen concentration indicated that the keeping quality increases markedly with decreases in the oxygen concentration below 5 percent, however. The relationship of keeping

quality in days to the initial oxygen concentration of the container atmosphere in percentage appeared to be of a reciprocal nature, that is, the time required to produce tallowy flavors in packed dried milks or to reach a given peroxide value of pure milk fat, and the oxygen concentration used, appeared to be inversely proportional to one another. The data presented were considered to indicate that the rate of autoxidation of milk fat varies directly with the oxygen concentration.

Keeping quality of milk, L. H. BURGWARD and D. V. JOSEPHSON. (Ohio State Univ.). (*Milk Dealer*, 35 (1946), No. 5, pp. 44, 100-101, illus. 1).—A test of 184 bottles of milk from eight lots and five plants is reported in which it was found that regular grades of pasteurized milk would stay sweet for 7 to 28 days under conditions such as might normally be imposed by the average consumer. Home refrigeration temperatures below 45° F., and preferably down to 40°, are deemed desirable. The treatment the milk received and the temperatures of the refrigerator were greater factors than the number of bacteria present in the milk when the tests were started. There was no appreciable increase in the bacterial count up to 4 days in any of the samples, and no change in the flavor until the lots were from 4 to 17 days old. The vitamin C content of the fresh milk and on storage varied greatly, while the riboflavin content was practically the same for all lots and little was lost in storage.

Factors which contribute to the physical stability of frozen cream, R. W. BELL and C. F. SANDERS. (U. S. D. A.). (*Jour. Dairy Sci.*, 29 (1946), No. 4, pp. 213-220, illus. 3).—Extending recent work on much smaller samples held in frozen storage for periods of less than 48 hr. (E. S. R., 93, p. 763), the authors here report upon results of freezing of 150-cc. cream samples in small cans at —17° C. in air and in ethanol, and at —29°, the freezing requiring 4 hr., 50 min., and 25 min., respectively, followed by storage during periods of from 2 days to several months at temperatures of —9° and —17° in air and of —29° in ethanol.

Factors found to contribute to the stability of cream frozen and held under the experimental conditions stated were: (1) The use of freshly drawn milk which contains small, unclumped fat globules; (2) maintenance of these globules in a fluid, completely dispersed state until freezing time; (3) quick-freezing to retain this degree of dispersion; and (4) a storage temperature sufficiently low to prevent the physical changes which cause localized crowding, distortion, and disruption of the fat globules and consequent oiling off on thawing. It was concluded that frozen cream which is prepared and maintained under these conditions will have a stable emulsion and a good body when thawed after several months storage.

Studies on compressed whole milk powder, C. C. THIEL (*Jour. Council Sci. and Indus. Res. [Austral.]*, 18 (1945), No. 4, pp. 391-406, illus. 3).—"Compression of spray-dried whole milk powder to a density of 1:15 to 1:20 reduced the interstitial oxygen as effectively as the usual gas packing in tins, but neither cellophane nor waxed paper wrapping prevented uptake of atmospheric oxygen or moisture. Blocks containing 20 percent of cane sugar were much more friable and kept better than those made entirely of milk powder. Vanillin also improved the keeping quality of the blocks."

The keeping quality of Australian milk powders, C. C. THIEL and E. G. PONT (*Jour. Council Sci. and Indus. Res. [Austral.]*, 18 (1945), No. 4, pp. 373-390).—"A preliminary survey of the relative keeping qualities of several Australian spray-dried and roller-dried, skim and whole milk powders has been made. Gas packing did not materially improve the storage life of skim

milk powders but greatly increased the life of whole milk powders. In commercial practice, the advantages of gas packing were largely nullified by the presence of leaking tins. Skim milk powders when reconstituted after storage with fresh flavoured butterfat were no better in flavour than reconstituted gas-packed whole milk powders stored under identical temperature conditions. Variations in the keeping quality of powders made at different times by any one factory were considerable and great differences in the keeping quality of whole milk spray-dried powders from different factories were noticed. The roller-dried whole milk powders examined were inferior in flavour to the better quality spray-dried whole milk powders. The influence of storage temperatures (15°, 30°, and 37° C.) was not marked either with the skim or whole milk powders. No correlation between bacterial counts and initial quality or condition after storage was observed."

The oxygen content of the atmosphere in containers of dried milk packed in nitrogen, 'P. S. SCHAFFER and G. E. HOLM. (U. S. D. A.). (*Jour. Dairy Sci.*, 29 (1946), No. 4, pp. 207-212, illus. 4).—The preliminary observations noted on page 384, made in direct measurement of the volumes and composition of container gases, were confirmed with respect to the relative importance of time, temperature, and degree of evacuation in reducing the oxygen concentration of the container gases." That the quantities of adsorbed gases do not decrease to a great extent with increases in the value of these factors within practical limits was also indicated by the desorption values obtained. It was pointed out that if equilibrium had been attained in each case, the rate of decrease of the final oxygen content in the containers should have been of a logarithmic nature, since the percentage oxygen removed in each evacuation was a constant. However, the rate obtained practically was not of a logarithmic nature. This result is attributed tentatively to the fact that the values for the percent oxygen in the container atmospheres were not equilibrium values. The relatively high efficiency of a second evacuation stage in decreasing the percent oxygen content of the container gases was indicated. The rate of desorption seemed to vary with different dried milks, however. The efficiency of gassing procedures should have been established for the product concerned in each case, therefore. The use of two stages of evacuation at 3 mm. pressure, with a 3- to 4-day intervening holding period, produced a final oxygen concentration in the container of approximately 1 percent. Increasing the duration of the holding period further reduced the final oxygen concentration.

VETERINARY MEDICINE

Lander's veterinary toxicology, rev. by J. A. NICHOLSON (*Chicago: Alexander Eger, 1945, 3. ed., pp. 329+, illus. 39*).—This is a third revised edition (E. S. R., 55, p. 776).

The role of disinfection in veterinary medicine.—I, Sterilization of surgical instruments, E. C. MCCULLOCH. (Wash. Expt. Sta.). (*Jour. Amer. Vet. Med. Assoc.*, 108 (1946), No. 829, pp. 242-249, illus. 4).—This discussion includes experimental data as to the time and temperature required for dry heat sterilization.

[Miscellaneous papers] (*Jour. Amer. Vet. Med. Assoc.*, 108 (1946), No. 828, pp. 148-151, 152, 157-160, 162, 169-171, 179-183, illus. 13).—These include A Newly Developed Anesthetic for Horses, by E. W. Millenbruck and M. H. Wallinga, in which the new anesthetic consisted of freshly prepared chloral hydrates (1.0 oz.), magnesium sulfate (0.5 oz.), pentobarbital sodium

(100 gr.), and distilled water to make 1,000 cc.; Anomalous Posterior Vena Cava of a Dog, by J. H. Burt (Kans. State Col.); An Embryonal Mixed Tumor in the Lungs of a Calf, by H. R. Seibold (U. S. D. A.); Use of DDT to Control Sarcoptic Mange, by E. N. Moore; Report on the Use of a New Acid-Ester Preparation in Certain Dermatological Conditions in Animals, by L. R. and W. R. Haubrich, in which favorable results are reported from the use of Cerbinol in the treatment of foot rot in cattle and sheep, ringworm in cattle, and moist eczema and ear canker in dogs; and Further Tests on a Fit-Producing Dog Food, by A. F. Morgan and M. Groody (Univ. Calif.).

[Miscellaneous papers] (*Jour. Amer. Vet. Med. Assoc.*, 108 (1946), No. 850, pp. 324-325, 327-328, 334-338, illus. 5).—The following contributions are noted: A Method for the Aseptic Bleeding of Animals, by W. E. Maderious (Univ. Calif.); The Treatment of Enteritis with Sulfathalidine, by N. L. Garlick; and Lymphocytoma (Leucemia) in the Cow, by D. E. Jasper, J. H. Sautter, and W. A. Malmquist (Minn. Expt. Sta.).

[Miscellaneous papers] (*North Amer. Vet.*, 27 (1946), No. 3, pp. 159-161, 162-164, illus. 4).—These include discussions entitled Urinary Calculi [in Steers], by H. E. Jensen; and Systemic Blastomycosis in Dogs—A Report of Two Cases, by H. R. Seibold (U. S. D. A.).

[Abstracts of papers on parasitology] (*Jour. Parasitol.*, 31 (1945), Sup., pp. 7-9, 10-11, 12, 13, 15, 17, 18-19, 20, 21, 22, 23).—Abstracts of papers presented at the 1946 meeting of the American Society of Parasitologists included the following of interest to veterinary science: Pathogenicity of Pure Culture *Trichomonas gallinae* Orally Administered to Clean Pigeons, by R. M. Stabler and F. B. Engley, Jr. (pp. 7-8); Further Studies on the Inoculations of *Trichomonas foetus* (Protozoa) in Heifers, by B. B. Morgan (p. 8), Toxicity of Cecal Cores From Chickens Infected With the Protozoan *Eimeria tenella*, by M. J. Bradford and C. A. Herrick (p. 8), and Studies on the Cytochrome Oxidase of the Pig Ascaris, by C. A. Herrick and M. Thede (pp. 18-19) (all Univ. Wis.); Dosage of *Eimeria stiedae* Related to Severity of Liver Coccidiosis, by H. A. Jankiewicz (p. 8); Cryptozoites and Metacryptozoites of *Plasmodium relictum* in Canaries and Pigeons, by F. Coulston and C. G. Huff (pp. 8-9); *Plasmodium circumflexum* in the Ruffed Grouse in Ontario, by A. M. Fallis (p. 9); Studies on *Plasmodium gallinaceum* Brumpt—IV, Parasitemia and Survival in Blood-Induced Infections in Young Chicks, by W. C. Cooper and G. R. Coatney (p. 9) (*E. S. R.*, 94, p. 664) V, Quinine Standardization in Screening Tests Against Blood-Induced Infections in Young Chicks, by G. R. Coatney and W. Clark (p. 12), and VI, A Study of the Pathology in Young Chicks, by L. R. Hershberger and G. R. Coatney (p. 9); *Plasmodium elongatum* in Pekin Ducks, by F. Wolfson (p. 10); The Relations Between Pantothenic Acid and *Plasmodium gallinaceum* Infections of the Chicken, by S. Brackett and E. Waletzky (pp. 10-11); The Relative Activity of Sulfanilamides and Other Compounds in *Eimeria tenella* Infections of the Chicken, by E. Waletzky and C. O. Hughes (p. 11); Aspects in the Control of Intestinal Coccidiosis in Commercial Rabbitries by the Use of Phthalylsulfathiazole, by E. E. Lund (p. 11); The Biological Status of *Sarcocystis*, by L. A. Spindler and H. E. Zimmerman, Jr. (p. 13), Ecology of the Metacercariae of *Fasciola hepatica* in Southern Texas and Its Relationship to Liver Fluke Control in Cattle, by O. W. Olsen (p. 20), The Thermal Death Point of *Cysticercus bovis*, by R. W. Allen (p. 21), and A Note on the Genus *Axine* Abildgaard (Trematoda: Monogenea), by E. W. Price (p. 22) (all U. S. D. A.); Liver Coccidiosis Prevented by Sulfasuxidine, by H. A. Jankiewicz (p. 15); Treatment of Canine Filariasis With Trivalent Arsenicals (*p*-Arsenosobenzamides),

by G. F. Otto and T. H. Maren (p. 17); Studies of Sheep Parasites—VI, Observations on Weather in Relation to Untreated Nematode Infections, by P. A. Hawkins (p. 17) (Mich. State Col.) (E. S. R., 93, p. 622); Hydrogen Ion Concentration as a Factor in Age Resistance to the Fowl Ascarid, by B. B. Riedel and J. E. Ackert (p. 18) (Kans. State Col.); An Anomalous Experience With Phenothiazine, by P. D. Harwood (p. 18); Additional Studies on the Effects of Nodular Worm Infections on Calves During the Prepatent Period, by R. L. Mayhew (p. 19) (La. State Univ.); The Nature of the Mechanism of Encapsulation in Trichiniasis, by W. W. Wantland, C. L. Bardes, and R. S. Levine (pp. 21-22); and Parasite Studies of Quail, *Colinus virginianus* and *Colinus virginianus texanus*, in Mississippi, by J. W. Ward (p. 23) (Miss. State Col.).

Lentin in veterinary medicine: A review, K. MAYER (*North Amer. Vet.*, 27 (1946), Nos. 2, pp. 81-89; 3, pp. 151-158).—The physiological basis for the use of lentin is discussed, and its application to specific diseases is reviewed in detail. There are 32 references.

Efficacy of various agents for delaying absorption of penicillin, E. R. DOLL and W. W. DIMOCK. (Ky. Expt. Sta.). (*Jour. Amer. Vet. Med. Assoc.*, 108 (1946), No. 830, pp. 310-313).—Serum levels resulting from the combination of several agents with saline solution of penicillin are tabulated. It is concluded that "the use of vasoconstrictor drugs, adrenalin and neosynephrin, with saline solutions of penicillin produces only a short prolongation of the effective blood level period in the horse, and offers very little advantage in therapeutic use of the drug. Concentrated solutions of dextrose caused no prolongation of the detectable blood levels over that obtained with saline solutions. The use of dextrose or gelatin in combination with vasoconstrictor drugs offers no significant advantage over saline preparations. Erratic absorption and low blood levels following their administration would be distinct disadvantages in therapeutic use of penicillin. A suspension of calcium penicillin in oil appears to be a satisfactory preparation, having about double the efficiency of saline solutions for maintaining an effective blood concentration in horses."

Some toxicological and pharmacological properties of streptomycin, H. MOLITOR, O. E. GRAESSLE, S. KUNA, C. W. MUSHETT, and R. H. SILBER (*Jour. Pharmacol. and Expt. Ther.*, 86 (1946), No. 2, pp. 151-173, illus. 8).—In these tests, the pharmacological and toxicological properties of streptomycin were found to be greatly influenced by the presence of traces of impurities and varied considerably in different animal species. The signs and symptoms produced by repeated daily administration of streptomycin over periods of 5-80 days also varied with the animal species. "Weanling rats show a slight retardation of growth and develop a pronounced nervous hyperexcitability. No such changes were noted in adult rats or in mice. Monkeys exhibit a slight impairment of hepatic and renal function and show upon autopsy a fatty infiltration of the liver and, to a lesser degree, of the kidney. These changes are reversible. Dogs develop a mild to severe impairment of renal function, and show upon autopsy lipid deposits in the kidney and liver. In addition, they exhibit signs of cerebellar or labyrinthine disturbance."

Other findings are also reported and discussed in detail.

Chromates in animal nutrition, W. G. GROSS and V. G. HELLER. (Okla. Expt. Sta.). (*Jour. Indus. Hyg. and Toxicol.*, 28 (1946), No. 2, pp. 52-56, illus. 1).—This problem was studied because of possible toxicity from stream contamination by industrial wastes and included tests with rats, mice, and rabbits. In digestion trials with rabbits, up to 500 p. p. m. of potassium chromate did not affect the utilization of food, but 1 percent zinc chromate

markedly lowered digestion coefficients on practically all components of the feed.

DDT: A review, with special reference to veterinary medicine, L. A. KANEGIS and M. H. ROEPKE. (Minn. Expt. Sta.). (*Jour. Amer. Vet. Med. Assoc.*, 108 (1946), No. 830, pp. 316-321).—This review includes 32 literature references.

Toxicity of rancid fats, F. W. QUACKENBUSH. (Purdue Univ.). (*Oil & Soap*, 22 (1945), No. 12, pp. 336-338).—This review indicates that one of the chief adverse effects of rancid fats is the destruction of vitamins and other dietary essentials. Certain types of anemia, dermatitis, and reproductive failure are not readily so explained, and it is thought that rancid fats are able to exert a direct toxic effect.

Human encephalitis of the western equine type in Minnesota in 1941: Clinical and epidemiological study of serologically positive cases, C. M. EKLUND (*Amer. Jour. Hyg.*, 43 (1946), No. 2, pp. 171-193, illus. 11).—In this extensive study, "no evidence was obtained that would indicate that domestic animals are the important factor in causing human infection."

Chemotherapy of Erysipelothrix rhusiopathiae infections in mice, M. WOODBINE (*Vet. Jour.*, 102 (1946), No. 4, pp. 88-93).—Tests in vitro and in mice with seven strains of *E. rhusiopathiae* did not "justify the conclusion that infections of *E. rhusiopathiae* in swine will prove readily amenable to chemotherapy with penicillin."

The incidence, type, and bacteriology of Salmonella infection in the Army in India, W. HAYES and J. F. FREEMAN (*Indian Jour. Med. Res.*, 33 (1945), No. 2, pp. 177-193, illus. 1).—In connection with this survey, it is pointed out that almost without exception *Salmonellas* which have been proved to be pathogenic for man have also been incriminated as the cause of disease in animals.

Natural occurrence of an "induced" antigen in Salmonella cultures, P. R. EDWARDS and A. B. MORAN. (Ky. Expt. Sta.). (*Soc. Expt. Biol. and Med. Proc.*, 61 (1946), No. 3, pp. 242-243).—The present note records the occurrence in nature of antigens apparently identical with those obtained by cultivation of *Salmonella* in agglutinating serum. It is thought that other antigens hitherto observed only in cultures exposed to agglutinating serum probably also occur in nature. The transformability of apparently distinct types is discussed, and it is stated that a reexamination of some of these types is indicated.

Trypanosoma equiperdum antigen for complement fixation.—I, Preliminary report: Preparation and titration, V. B. HARTRIDGE and M. D. SCHNEIDER (*Jour. Amer. Vet. Med. Assoc.*, 108 (1946), No. 829, pp. 224-226).

Sour milk and the tubercle bacillus, A. T. R. MATTICK and A. HIRSCH (*Lancet* [London], 1946, I, No. 12, pp. 417-418).—An experiment was carried out to test the effect on the tubercle bacillus of actively growing inhibitory streptococci in milk in which guinea pigs were injected intramuscularly with the centrifuged deposit from clotted milk samples containing either 500 or 2,000 tubercle bacilli per cubic centimeter and 1 percent by volume of a 24-hr. culture of either the control *Streptococcus cremoris* or a similar inoculum of one of the streptococci used for the production and isolation of the antibiotic substance 1354. When, after 8 weeks, the animals were killed and examined, it was found that the inhibitory streptococcus had produced sufficient antibiotic substance to kill or render avirulent up to 2,000 tubercle bacilli per cubic centimeter in 50 cubic centimeters of milk, but that no such effect was produced by the lactic streptococcus, which merely formed acid to a somewhat

larger extent. It is therefore concluded that "acidity as such does not destroy the tubercle bacillus in milk, but that if streptococci producing the inhibitory substance previously reported on are present these organisms are destroyed or made avirulent."

Changes of the serum phosphatase level after infection of cows with *Brucella abortus*, W. BRAUN. (Calif. Expt. Sta. coop. U. S. D. A.). (*Jour. Immunol.*, 52 (1946), No. 3, pp. 137-144, illus. 1.).—Observations on the serum phosphatase levels of cows before and after infection with *B. abortus* were made as part of an experiment which involved periodical testing of 23 blood constituents of 49 animals. The age of the animals used ranged from 18 mo. to 13 yr.

It was found that 39 cows which showed agglutinative titers after infection with *B. abortus* had a significantly lowered average phosphatase level for approximately 2 mo. after infection, compared with pre-exposure levels and average levels of 9 noninfected control animals. One exceptional animal which failed to show agglutinins after infection exhibited a rapid rise of its phosphatase level for 5 mo., up to 300 percent above the level of all other animals. A second overwhelming infection of this animal with *B. abortus* again caused a rapid increase of its phosphatase level. Six weeks later, however, this animal suddenly showed a rapidly ascending agglutination titer and the phosphatase level decreased simultaneously with the appearance of the titer. These results are discussed (1) on the basis of possible similarities between antibodies and phosphatase molecules, and (2) on the basis of the concept that antigens act as biocatalysts and that specific antibodies formed as final reaction products in response to antigenic stimuli fulfill the function of specific inhibitors of enzymes.

The relationship of dosage and site of inoculation to the agglutinin response to *Brucella abortus* strain 19 vaccine: A comparison of the subcutaneous, intracutaneous, and intracaudal routes, A. D. CAMPBELL and A. W. RODWELL (*Jour. Compar. Pathol. and Ther.*, 55 (1945), No. 4, pp. 277-289, illus. 5).—In order to determine the influence of dosage and route of inoculation upon the agglutinin response to *B. abortus* strain 19 vaccine, groups of adult cattle were inoculated either subcutaneously (5, 1, 0.2, or 0.04 cc.), intracutaneously (0.2 cc.), or intracaudally (1, 0.2, or 0.04 cc.). Maximal mean titers 14 days after inoculation were compared statistically.

The agglutinin response was found to be closely related to dosage and to route of inoculation. The most efficient route for agglutinin production was the intracaudal, which in addition has technical advantages and is free from severe and persistent local reactions. One cc. intracaudally was much more efficient than 5 cc. subcutaneously, was more economical, and caused a transient diminution of milk yield at least no greater than that reported after 6 cc. subcutaneously. Doses of 0.2 cc. or even 0.04 cc. intracaudally appeared to be at least as efficient as 5 cc. subcutaneously or 0.2 cc. intracutaneously. "In our experience the greater the agglutinin response the longer the period necessary for return to negative agglutinin status. Local reactions after subcutaneous inoculation were frequently considerable, but after intracutaneous or intracaudal inoculation they were unimportant and transient." Of 90 cows vaccinated during pregnancy 89 calved normally. Strain 19 was not found in the mammary secretion of any of the cows vaccinated.

Immunity in cattle vaccinated with *Brucella abortus* strain 19 and a note comparing this strain with 45/20, S. J. EDWARDS, A. MCDIARMID, R. S. de ROFF, and D. H. MCLEOD (*Vet. Rec.*, 58 1946), No. 13, pp. 141-146, illus. 1).—Continuing the work with strain 45/20 (*E. S. R.*, 93, p. 621); this study

tested the immunizing value of strain 19. It is concluded that a vaccine prepared from this strain confers a substantial degree of immunity in cattle against a virulent infection applied 35 weeks after vaccination. No evidence of the establishment of a persistent infection from this vaccine strain was obtained.

The transference of agglutinins for *Brucella abortus* from cow to calf and their persistence in the calf's blood, A. MCDIARMID (*Vet. Rec.*, 58 (1946), No. 15, pp. 146-149, illus. 3).—Using 16 heifers exposed to a virulent infection during pregnancy in the test of strain 19 vaccine, by Edwards et. al., noted above, no agglutinins were demonstrated in the blood of the calf till it had ingested colostrum containing immune bodies. Agglutinins then commonly appeared in from 1 to 3 hr., reaching their maximum by 24 hr. and then receding as a logarithmic curve over periods varying from days to months. The period of persistence depended to a large extent on the titer of the colostrum.

The survival of *Corynebacterium pyogenes* in discharges from the udder and the uterus of the cow, R. W. ROACH (*Vet. Rec.*, 58 (1946), No. 15, pp. 169-171).—Results are given of the effect of acriflavine, iodine, metholyl, dettol, crystal violet, Milton, and lysol on *C. pyogenes* when this organism was present in discharges from the udder and uterus. With the exception of iodine (the use of which is suggested) and lysol, none of the above disinfectants had any appreciable effect on the organisms. The organism was shown to remain alive for at least 19 days in a sample of summer mastitis milk kept at room temperature. While readily destroyed by heat of 80° C., clotting of the discharge at this temperature may assist the organism to survive for longer periods. Instruments contaminated with *C. pyogenes* discharges were found to be difficult to sterilize.

The intramammary therapy of bovine mastitis (*Jour. Amer. Vet. Med. Assoc.*, 108 (1946), No. 828, pp. 127-135).—This is a report of a subcommittee of the Committee on Animal Health of the National Research Council, consisting of R. B. Little (chairman), C. S. Bryan (Mich. State Col.), W. E. Petersen (Univ. Minn.), W. N. Plastring (Univ. Conn.), and O. W. Schalm (Univ. Calif.). Its purpose is set forth as "to point out the value and limitations of intramammary therapy and to summarize results obtained in controlled investigations on each of the chemotherapeutic and antibiotic agents available for use in the treatment of bovine mastitis." Following a discussion of available chemotherapeutic and antibiotic agents, it is stated that treatment is not the answer to the bovine mastitis problem. "With udders suitable for medication, in which a diagnosis of the infection has been made, proper medication can be expected to salvage many cases of chronic mastitis and thus prolong the usefulness of cows previously regarded as hopeless. With regret, it is necessary to point out that, up to the present, treatment cannot be regarded as the answer to the problem of mastitis, for the real answer is still, now as before, prevention of infection."

Studies on bovine mastitis.—III, Penicillin therapy in streptococcic mastitis, H. J. HARDENBROOK, J. O. ALBERTS, and H. S. BRYAN. (Univ. Ill.). (*Jour. Amer. Vet. Med. Assoc.*, 108 (1946), No. 828, pp. 140-142, illus. 1).—Continuing this series (E. S. R., 93, p. 497), results of the treatment of 44 *Streptococcus agalactiae* positive quarters of 18 cows are reported.

The udder infusion of 25,000 units of sodium penicillin in each quarter proved to be relatively nonirritating. Milk production diminished only 2.54 percent the week following treatment. Twenty-seven quarters became negative after one udder infusion, 7 required two infusions, and 3 required three

infusions before becoming negative. Seven quarters remained positive following three separate udder infusions at intervals of 12 and 14 days. Fourteen of the 18 cows became negative, while 4 cows remained positive as judged by microscopical and bacteriological examinations 1 mo. after treatment. Therapeutic results did not correlate with the number of lactations, which varied from first to fifth or with the stage of lactation which varied from the first month to the seventeenth month. Equally good results were obtained regardless of the condition of the udder or pathological change which had developed within the udder.

Effects of infusion of penicillin in the bovine mammary gland, D. E. JASPER and F. J. WEIRETHER. (Minn. Expt. Sta.). (*Vet. Student*, 8 (1945), No. 2, pp. 73-76, illus. 2).—From this review it is concluded that penicillin is relatively nontoxic and large amounts may be infused without danger of disturbing reactions. The concentration in the gland is reduced most rapidly during the first 10-hr. period following infusion and may be accounted for chiefly by dilution with milk being secreted and by migration out of the gland. Distilled water is regarded as a more satisfactory diluent than is physiologic saline.

Om streptokokmastitis [Streptococcic mastitis], P. L. HANSEN (*Norsk Vet. Tidsskr.*, 58 (1946), Nos. 2, pp. 43-59, illus. 1; 3, pp. 79-94).—A review of the literature is supplemented by observations on the effect of the disease on milk production and other phases.

Tennessee's mastitis control plan, A. W. MURRAY (*Jersey Bul.*, 65 (1946), No. 4, pp. 244, 259-260, 262, 264-265).—A program initiated on March 16, 1945, is outlined whereby 15 herds have been selected to demonstrate "just what could be done to eliminate, control, and prevent mastitis through good herd management and proper treatment."

Effects of stilbestrol in retained placenta, G. R. MOORE. (Kans. State Col.). (*Jour. Amer. Vet. Med. Assoc.*, 108 (1946), No. 327, pp. 79-83). Observations on the therapeutic effects of stilbestrol on cases of bovine retained placenta indicated that it had little if any value in the expulsion of the placenta and may sometimes be definitely harmful.

Effects of stilbestrol on pyometra following retained fetal membranes, G. R. MOORE. (Kans. State Col.). (*Jour. Amer. Vet. Med. Assoc.*, 108 (1946), No. 328, pp. 153-156).—Forty-three cows suffering from pyometra following the manual removal of retained placentae were treated with stilbestrol 2 weeks after removal. In this group 97.8 percent retained their fertility as compared to 86 percent in a control group of 50 cows. In the controls, an average of 144.8 days per cow elapsed from parturition to the next conception following treatment, while only 86.2 days on the average elapsed in the treated group.

Effects of chorionic gonadotropin on cystic ovaries in the cow, G. R. MOORE. (Kans. State Col.). (*Vet. Med.*, 41 (1946), No. 5, pp. 163-164).—A group of 18 dairy cows was treated for cystic ovaries with chorionic gonadotropin. Twelve showed improvement within 11 days following a single treatment, with 2 animals relapsing. Eight were treated a second time, with 7 recoveries. One cow was treated a third time without success. Of the 18 cows, 17 experienced normal cycles following the first or second treatment, and 12 are known to have conceived.

Tick-transmitted protozoa in the peripheral blood of clinically healthy cattle in Palestine, I. H. PATTISON (*Jour. Compar. Pathol. and Ther.*, 55 (1945), No. 4, pp. 243-249, illus. 4).—This examination of single blood smears from 550 clinically healthy cattle and of repeated smears from 7

healthy cattle indicated that a high percentage of animals were carrying tick-transmitted parasites. *Anaplasma marginale* and *Theileria annulata* are very commonly found, but are never numerous, and *Babesia bigemina* parasites may be found occasionally. *Babesiella berbera* parasites were found in no case. The forms of parasites found are described, and certain abnormalities of the red blood cells noted.

Scoffing at bovine tuberculosis eradication (*Jour. Amer. Vet. Med. Assoc.*, 108 (1946), No. 829, pp. 227-228).—This is mainly a reply to the article by Rainey (E. S. R., 94, p. 379).

Some observations on the poisonous properties of bracken (*Pteris aquilina*), G. D. SHEARER (*Jour. Compar. Pathol. and Ther.*, 55 (1945), No. 4, pp. 301-307).—Freshly cut bracken (*P. aquilina*) was fed to two heifers. One of these ate 915 lb. as an exclusive diet with no definite signs of illness till the sixty-eighth day but eventually died. The other, receiving a ration of 50 percent bracken, consumed 678 lb. in 78 days without showing any symptoms of poisoning.

Chemical analysis of the plant during the growing season showed it to be of low nutritive value and to contain varying amounts of a catechol tannin, but no other substance to which its poisonous properties could be ascribed was found.

Chronic molybdenum poisoning in cattle, J. W. BRITTON and H. GOSS. (Univ. Calif.). (*Jour. Amer. Vet. Med. Assoc.*, 108 (1946), No. 828, pp. 176-178).—Excessive amounts of molybdenum were found in the forage and in the viscera of affected cattle in a localized area of Kern County, Calif., and it is assumed that the disease observed in these young animals resulted from the ingestion of excessive amounts of molybdenum in the forage. A portion of the disease, as observed in the field, was reproduced by administering daily doses of sodium molybdate to a heifer calf.

Incidence of pathogenic bacteria in market milk of Cairo, A. M. WAHBY and A. ROUCHDY (*Vet. Jour.*, 102 (1946), No. 4, pp. 94-102).—An examination of 200 samples of Cairo market milk, of which 76 were raw, 44 boiled, and 80 mixed and boiled, revealed that "all samples from which pathogenic organisms were actually isolated or their presence was highly probable (high agglutination titers) were either of raw or of mixed (raw and boiled) milk."

The serological diagnosis of Johne's disease of sheep, B. SIGURDSSON, H. VIGFUSSON, and S. THEODORS (*Jour. Compar. Pathol. and Ther.*, 55 (1945), No. 4, pp. 268-276).—The results of a new diagnostic complement fixation test for Johne's disease among sheep are described. The antigen used was extracted from the infected intestinal mucosa, and the study was carried out on an infected flock of 55 sheep. Out of 31 sheep found to be infected on slaughter, 30 had proved to be serologically positive, the remaining one not having been subjected to an adequate test. The sera from 4 more sheep in which no lesions could be found in the intestines were also found to be strongly positive. Of 118 sheep from healthy areas tested as controls, only 4 showed serological reactions and these were very weak. Thirty-nine sheep of the experimental flock were also tested by means of the intradermal johnin test, using johnin PPD as described. Only about 50 percent of the infected sheep reacted to the various johnins in the strengths used.

Studies in louping-ill.—I, Cultivation of louping-ill virus in vitro. II, Pathogenic properties of culture virus, D. R. WILSON (*Jour. Compar. Pathol. and Ther.*, 55 (1945), No. 4, pp. 250-267, illus. 2).—Studies in immunity to louping-ill were carried out to determine whether tissue culture virus could be used as an efficient substitute for sheep tissue virus in vaccine therapy.

The paper here presented as part of that investigation deals with (1) cultivation of the virus in vitro with the object of obtaining sufficient quantities to warrant a study of its antigenic and immunizing value; and (2) observations on the pathogenic properties of culture virus.

Contag'ous ovine pneumonia caused by a filterable virus, Z. MORCOS and O. A. and R. ZAKI (*Vet. Med.*, 41 (1946), No. 6, pp. 202-204).—Outbreaks of contagious pneumonia in Egypt are described as caused by a filterable virus present in the blood and internal organs of sheep. This virus was pathogenic to rabbits, but not to caviae, white rats, mice, or pigeons, on experimental inoculation. Secondary organisms were isolated which played an important part in complicating the disease. Formalized tissue vaccine prepared from liver and spleen gave promising results in immunization.

Etude de l'action de la phénothiazine sur la strongylose gastro-intestinale du mouton [Action of phenothiazine on the gastrointestinal strongyles of sheep], M. ROSE ([Algeria] *Inst. Agr. et Serv. Rech. Expt. Agr. Algérie Ann.*, 2 (1945), No. 1, pp. 5-12, illus. 2).—From tests carried on with three lots of two sheep each, it is concluded that phenothiazine is an efficacious vermicide for gastrointestinal strongylosis, though more than one dose is always necessary.

Transmission of *Brucella suis* from swine to cattle under pasture conditions, C. ELDER (*Missouri Sta. Res. Bul.* 398 (1946), pp. 15).—Eight cows were kept in close contact in a small pasture with swine artificially infected with *B. suis*. There was no evidence of spread of infection from the swine, and all attempts to isolate *Brucella* organisms from the cattle were negative, although control negative gilts acquired the infection when running in the same pasture. Cultures of *B. suis* were isolated from both infected hogs and previously negative gilts which served as controls.

Three abortions in the cattle occurred while the experiment was in progress, but in no case was it possible to isolate *Brucella* organisms from the aborted fetuses or the cows. There was no evidence of any sterility or breeding difficulty, and cases of retained placenta were not observed. Several of the cows on experiment developed low blood agglutination titers and varied from negative to complete agglutination in dilutions of 1-160, but there was no proof that these low titers were actually due to *B. suis*.

A transmissible gastroenteritis in pigs, L. P. DOYLE and L. M. HUTCHINGS. (Ind. Expt. Sta.). (*Jour. Amer. Vet. Med. Assoc.*, 108 (1946), No. 829, pp. 257-259).—A sporadic disease having clinical and pathologic features of gastroenteritis has been observed to cause heavy death losses in baby pigs. Swine more than a few days old are also affected, but less severely.

The disease developed promptly in baby pigs following pen exposure, and also following per os administration of either triturated gastrointestinal tract and content or the filtrate of the triturated gastrointestinal tract. One effort to transmit the disease to a calf failed.

Concentration of hog-cholera virus in the blood of artificially infected swine at different stages of the disease, C. G. COLE, R. R. HENLEY, and E. D. HUBBARD. (U. S. D. A.). (*Jour. Amer. Vet. Med. Assoc.*, 108 (1946), No. 828, pp. 143-147).—Each of five pigs was injected with 2 cc. of regular BAI hog-cholera virus and bled at different intervals ranging from 3 to 9 days after injection. Various dilutions were made of each blood, and selected dilutions were tested for virulence in doses ranging from 1/25,000 cc. to 1/10,000,000 cc. of the original virus-blood. All pigs that remained normal following injection of the diluted fractions were later injected with a known virulent virus. All developed cholera, and with few exceptions all died or

were killed for virus. Necropsies were held on all pigs that died or were killed, and with one exception all showed lesions characteristic of hog cholera.

Evidence obtained indicated that blood from cholera-infected pigs contains the most virus when drawn on the sixth to eighth day, inclusive. With the use of blood drawn on the sixth to ninth day, hog cholera was produced in eight pigs injected with 1/500,000 cc., in eight pigs injected with 1/750,000 cc., in eight pigs injected with 1/1,000,000 cc., and in two pigs injected with 1/2,500,000 cc. Of six pigs injected with 1/5,000,000 cc., five remained normal, and one developed cholera due perhaps to accidental exposure. Of six injected with 1/10,000,000 cc., all remained normal. A minimum lethal dose between 1/1,000,000 cc. and 1/2,500,000 cc. of virus was indicated.

Trichinae killed by 120-deg. F. dehydration, L. A. SPINDLER, C. F. DUNKER, and O. G. HANKINS. (U. S. D. A.). (*Food Indus.*, 18 (1946), No. 3, pp. 36-38, 210, 212, illus. 3).—Tests of the effect of dehydration on the viability of trichinae in pork showed that the larvae exhibited considerably greater resistance to dehydration at 102° and 70° F. than at 120°, and temperatures below this point are not recommended as a practicable procedure at this time. A temperature of 120° or higher, however, is considered safe, so far as infection by trichinae is concerned, in pork dried to a moisture level of 2 percent. "Even a moisture content as high as 7 or 8 percent would appear satisfactory from this point of view when the dehydration temperature does not fall below 120° F."

Further observations on the incidence of parasitic aneurysm in the horse, C. W. OTTAWAY and M. L. BINGHAM (*Vet. Rec.*, 58 (1946), No. 14, pp. 155-159, illus. 3).—An account is given of the examination of 87 ponies for evidence of infestation with *Strongylus vulgaris*, in which particular attention was paid to the location of parasitic aneurysms. Little correlation could be found between the physical condition of the animal, the number of eggs per gram of feces, the percentage of blood eosinophils, and the presence of aneurysms, and it is considered that the comparisons of such findings can be of small value for diagnostic purposes.

Penicillin therapy in fatal case of equine tetanus, D. L. LICHTY ([U. S.] *Off. Surg. Gen., U. S. Army Med. Dept. Bul.*, 5 (1946), No. 4, pp. 486-487).—An acute case in a 4-year-old gelding was treated with penicillin sodium, a total of 4,100,000 units being used. No appreciable gain or improvement was noted at any stage and the animal died on the eighth day.

Potassium deficiency in the dog, W. R. RUEGAMER, C. A. ELVEHJEM, and E. B. HART. (Wis. Expt. Sta.). (*Soc. Expt. Biol. and Med. Proc.*, 61 (1946), No. 3, pp. 234-238, illus. 1).—Dogs fed the basal ration used by S. G. Smith⁵ failed to grow and developed a paralysis curable by potassium therapy. One animal receiving biotin became paralyzed and responded to potassium therapy.

Quick protection and therapeutic effect of distemperoid virus, R. G. GREEN. (Univ. Minn.). (*North Amer. Vet.*, 27 (1946), No. 3, pp. 165-168).—This reports experiments with dogs from which it is concluded that "the distemperoid virus appears to be a tool of unprecedented value in the control and management of canine distemper," both as immunizing agent and, if used early in the course of infection, a specific therapeutic agent of great usefulness. See also a previous note (G. S. R., 94, p. 663).

Distemperoid virus interference in canine distemper, R. G. GREEN and C. S. STULBERG. (Univ. Minn.). *Science* 103 (1946), No. 2678, pp. 497-498).—Continuing the above study, it was found that a distemper virus modified by ferret passage so as to become a harmless vaccine for foxes and dogs

⁵Science, 100 (1944), No. 2600, pp. 889-890.

exhibits the interference or cell-blockade phenomenon with respect to a virulent distemper infection in foxes. Ten control foxes receiving virulent distemper virus died, while 80 foxes receiving distemperoid virus in addition lived.

Rabies and its control. H. N. JOHNSON ET AL. (*Jour. Amer. Vet. Med. Assoc.*, 108 (1946), No. 830, pp. 295-302).—This is a report prepared by a special subcommittee of the Committee on Animal Health, National Research Council. Recommendations for the control of the disease in the United States are included.

A rapid method for the diagnosis of rabies in animals. N. VEERARAGHAVAN (*Indian Jour. Med. Res.*, 33 (1945), No. 2, pp. 295-297).—A cultivation technic is described as being as delicate as the biological test and yielding results within a few hours even in grossly decomposed brains.

Poultry husbandry: Prevention and control of disease. K. T. MADDY. (Iowa State Col.). (*Vet. Student*, 8 (1945), No. 2, pp. 77-81).—The principles and practices of poultry sanitation and hygiene are outlined as essential to an effective disease control program.

A field case of nutritional encephalomalacia in chicks. R. H. COMMON and H. G. LAMONT (*Vet. Rec.*, 58 (1946), No. 17, pp. 191-192).—The case history of an outbreak in Northern Ireland of "nonrachitic leg weakness" not associated with ariboflavinosis or perosis is presented in some detail. Clinical, pathological, and nutritional evidence is adduced in support of the diagnosis of nutritional-encephalomalacia, although this condition has been very rarely reported in the British Isles.

Bone tumors in fowls injected intravenously with causative agent of Rous sarcoma. M. PIKOVSKI and L. DOLJANSKI (*Soc. Expt. Biol. and Med. Proc.*, 61 (1946), No. 3, pp. 246-248, illus. 1).—The appearance of an osteoid sarcoma in a series of chickens injected intravenously with the causative agent of Rous sarcoma derived from sarcoma cell cultures is reported.

A filtrable agent producing lymphoid tumors and osteopetrosis in chickens. B. R. BURMESTER, C. O. PRICKETT, and T. C. BELDING. (U. S. D. A.). (*Cancer Res.*, 6 (1946), No. 4, pp. 189-196, illus. 7).—This report describes briefly the manifestations of a filtrable agent associated with a transplantable lymphoid tumor of the chicken, noted by Olson (E. S. R., 86, p. 538) and demonstrated in three experiments involving 150 birds.

Inocula containing viable tumor cells induced tumor growth at the site of inoculation, metastasis to the viscera, and death to all birds in a relatively short time (average 10.2 days); whereas centrifuged extracts of the same tumors, or filtered plasma of birds bearing tumors, when injected intramuscularly, intraperitoneally, or intravenously into 2- to 3-day-old chicks, induced in 6 mo. a high incidence of osteopetrosis and lymphomatous tumors of the viscera (average of 81 percent on gross examination) but no tumors at the site of inoculation.

"These results suggest that the avian lymphoid tumor strain under study, which has been transferred serially in over 200 passages by transplantation of its cells carries with it a filtrable agent or agents capable of inducing osteopetrosis and lymphomatous tumors of the viscera after an incubation period of at least 2 mo."

Neoplastic disease of the fowl with special reference to its history, incidence, and seasonal variation. J. G. CAMPBELL (*Jour. Compar. Pathol. and Ther.*, 55 (1945), No. 4, pp. 308-321, illus. 1).—During a 5-yr. investigation of spontaneous neoplastic disease in the domestic fowl, 2,063 birds were submitted to detailed examination. In 386 cases of neoplastic disease encoun-

tered, with an incidence of 18.7 percent, 28 distinct types of neoplasia were observed. Neoplasms were most common in the Buff Rock breed (38.8 percent) and least in White Wyandottes (10.3 percent). The breed incidence for the various types of neoplastic disease was also investigated, but the only significant difference was the absence of leukemia in the White Wyandotte and Light Sussex breeds. The seasonal variation showed a maximum incidence in the spring months, particularly March, which was tentatively attributed to the stimulation of latent preneoplastic cells by sex hormones. A comparison of tumor distribution in visceral lymphomatosis (fowl paralysis) and lymphocytoma showed that in the latter the liver and intestines were involved more frequently than in fowl paralysis. A brief summary of the literature dealing with the incidence of neoplastic disease is given, and the problems associated with the classification of avian neoplastic disease are discussed.

A Malayan virus disease of fowls, W. ORR and K. T. JOHN (*Vet. Rec.*, 58 (1946), No. 11, pp. 117-119).—This paper, prepared in 1941 and delayed by the Japanese invasion of Malaya, discusses an epornithic disease which is believed to have been in existence in Malaya for an indefinite period prior to its recognition in 1934.

Does meat and bone meal cause nutritional disorders in chickens? E. J. SHEEHY, B. J. SENIOR, and E. M. BURKE ([Ireland] *Eire Dept. Agr. Jour.*, 42 (1945), No. 2, pp. 194-213).—Several series of feeding tests are reported from which it was concluded that neither meat and bone meal when fed in proper proportions (not more than 13 percent in the ration) nor meat meal is directly responsible for the production of any disorders in chickens. The need of providing a complete diet, including riboflavin and other members of the vitamin B complex, is emphasized. Results as to growth and progress were similar whether the origin of the meat and bone meal was the horse or ox. Meat meal from sound animals and manufactured under sanitary conditions was not found to be necessarily toxic to chickens if fed after decomposition, although "in the absence of fuller information as to the type of decomposition which took place in the sample under investigation it is emphasized that decomposed foods of any sort should not be fed to chickens."

Experimental zinc phosphide poisoning in fowls, A. ROBERTSON, J. G. CAMPBELL, and D. N. GRAVES (*Jour. Compar. Pathol. and Ther.*, 55 (1945), No. 4, pp. 290-300).—Using a modification of the method of Elmore and Roth (E. S. R., 91, p. 120) for the estimation of phosphide, the lethal dose of zinc phosphide for fowls was determined as lying between 7 and 17 mg. per kilogram of body weight and frequently was about 10 mg. Chronic effects were produced by repeated sublethal doses. The symptoms, lesions, and analytical findings are described, and their significance in toxicological work is discussed. See also a note by Hare and Orr (E. S. R., 92, p. 706).

Comparison between in vitro and in vivo glycogen utilization in the fowl nematode *Ascaridia galli*, W. M. REID (*Jour. Parasitol.*, 31 (1945), No. 6, pp. 406-410).—A comparison between in vivo and in vitro glycogen utilization in avian *A. galli* indicated that the in vitro technic for glycogen metabolism has probably reflected satisfactorily the conditions in vivo. *A. galli* apparently utilized the glycogen reserve much more rapidly than *A. lumbricoides*, which may account for its rapid expulsion after host starvation.

Effect of sulfaguanidine on the course of infection in chickens with *Eimeria tenella*, E. E. WEHR and M. M. FARR. (U. S. D. A.). (*Jour. Parasitol.*, 31 (1945), No. 6, pp. 359-365, illus. 1).—Continuing the studies of Farr and Allen (E. S. R., 86, p. 833), experiments were conducted with 388 birds. The feeding of 0.5 percent sulfaguanidine mash for 7 consecutive days decidedly

benefited young birds when treatment was begun 1 day before or within 2 days after experimental infection. Similar feeding of 1.2 percent mash prevented deaths among groups of birds placed on treatment 1 day prior to, on the day of, and 1 day after inoculation. The administration of this mash as late as the third day after infection markedly reduced mortality. The results apparently demonstrated a coccidiostatic action of sulfaguandine.

Sulfamerazine therapy in experimental cecal coccidiosis of chickens, M. M. FARR and E. E. WEHR. (U. S. D. A.). (*Jour. Parasitol.*, 31 (1945). No. 6, pp. 353-358).—Experiments were conducted with 593 chickens to determine the effect of sulfamerazine on the course of infection with *Eimeria tenella*. When administered in the mash in a concentration of 1 percent it materially reduced mortality from cecal coccidiosis, but this percentage of the drug was toxic as indicated by the presence of spleen and liver lesions and retarded weight gains. When fed before or within 1 day after inoculation it was markedly coccidiostatic as long as it was being administered, but within 4 to 6 days after cessation of this treatment clinical coccidiosis developed. One-fourth percent sulfamerazine mash was an effective prophylactic agent for cecal coccidiosis and also was of benefit as a treatment when fed within 2 days after inoculation. This percentage was considerably less toxic than 1 percent, but an occasional bird showed spleen and liver lesions; some loss in weight gains was noted.

Sulfamerazine as a prophylactic in pullorum disease in poults, F. E. MULLEN (*Jour. Amer. Vet. Med. Assoc.*, 108 (1946), No. 828, pp. 163-164).—Tests with 13,236 poults from pullorum-infected breeding stock receiving 0.5 percent of sulfamerazine in the starting mash for 5 days showed a loss of 3.9 percent as compared with 17 percent of 9,629 untreated birds. In this concentration sulfamerazine showed adverse effects if fed more than 5 days.

Note on Salmonella in poultry products, M. D. SCHNEIDER (*Jour. Amer. Vet. Med. Assoc.*, 108 (1946), No. 830, pp. 332-333).—Examination of 199 samples of egg pulp revealed 60 cultures of *S. pullorum* and 1 of *S. oranienburg*. In 63 samples of powdered whole egg, *S. typhimurium* was isolated from the product of a drying plant in Missouri, and *S. montevideo*, *S. paratyphi* B, *S. cerro*, and 2 cultures of *S. oranienburg* from egg powder produced in Oklahoma.

An outbreak of pasteurellosis in wild ducks, E. R. QUORTRUP, F. B. QUEEN, and L. J. MEROVKA (*Jour. Amer. Vet. Med. Assoc.*, 108 (1946), No. 827, pp. 94-100, illus. 8).—An outbreak in Texas is described as the first authentic record of pasteurellosis in wild ducks. A strain of *Pasteurella* which differs from *P. multocida* in its failure to grow on ordinary mediums, to produce H_2S and NH_3 , and by producing a moderate degree of hemolysis is described. This organism is especially virulent, killing ducks after oral administration in about 18 hr.

Treatment of Pasteurella multocida (fowl cholera) infection in wild ducks with autogenous bacterin and penicillin, F. B. QUEEN and E. R. QUORTRUP (*Jour. Amer. Vet. Med. Assoc.*, 108 (1946), No. 827, pp. 101-103).—In experiments carried on in connection with the outbreak noted above, autogenous bacterin and penicillin were both found to protect wild ducks against experimental infection with *P. multocida* (strain 800).

Recent studies on the treatment of infectious sinusitis in turkeys, E. MCNEIL and W. R. HINSHAW. (Univ. Calif.). (*Jour. Amer. Vet. Med. Assoc.*, 108 (1946), No. 829, pp. 260-261).—In these comparative tests, 4 percent silver nitrate in freshly prepared aqueous solutions proved superior to five other drugs, although 7 percent Protargol showed some promise.

Spirochetosis in turkeys (a preliminary report), H. A. HOFFMAN, T. W. JACKSON, and J. C. RUCKER (*Jour. Amer. Vet. Med. Assoc.*, 108 (1946), No. 830, pp. 329-332, illus. 2).—This is preliminary report of observations on a mild infection encountered in a flock of turkey hens in California. The course of the disease together with convalescence approximated 10 to 21 days or longer. Careful search failed to reveal the presence of the several varieties of ticks known to transmit spirochetosis in other species of birds.

. AGRICULTURAL ENGINEERING

"Common well" nomograph, I. J. HOOKS and H. GRAY. (Univ. Maine). (*Civ. Engin.*, 16 (1946), No. 4, pp. 175-176, illus. 1).—The authors point out that of eight assumptions upon which the Dupuit analysis of well output and corresponding water-table drawdown is based, five are never exactly fulfilled by nature and two other are theoretically incorrect. If, however, the slope of the ground-water table is rather small, the Dupuit formula gives satisfactory results. It is here stated in the form $q = \pi k \frac{H^2 - h^2}{\ln(R/r)}$ in which q denotes

the rate of water-discharge from the well, k denotes the coefficient of permeability of the aquifer, and the coordinates of any two points on the drawdown curve are given by (R, H) and (r, h) , respectively. The values of H and h are measured vertically from the surface of the impervious stratum, and the values of R and r are measured from the center of the well. For preliminary computations this integration is somewhat cumbersome because of the difference of two squares and the $\ln$ factor. The authors accordingly devised a nomograph by means of which: (1) If the coordinates of two points on the lowered water table are known, together with the coefficient of permeability, it is possible to find the discharge from the well; (2) if the coordinates of two points on the lowered water table are known, together with the discharge, it is possible to find the coefficient of permeability; and (3) if both the discharge and the permeability coefficient are known, together with the coordinates of one point on the drawdown curve, it is possible to find the depth of the water at a given distance from the well. The manner of using the figure for solutions of each of these three types is explained.

Surface water supply of the United States, 1943, part 3, Ohio River Basin (*U. S. Geol. Survey, Water-Supply Paper 973* (1945), pp. 652+, illus. 1).—This paper records measurements of stream flow for the year ended September 30, 1943.

Surface water supply of the United States, 1944, parts 4, 7, 9, 10, 11, and 14 (*U. S. Geol. Survey, Water-Supply Papers 1004* (1946), pp. 228, illus. 1; 1007 (1946), pp. 373+, illus. 1; 1009 (1946), pp. 360+, illus. 1; 1010 (1946), pp. 181+, illus. 1; 1011 (1946), pp. 405+, illus. 1; 1014 (1946), pp. 222+, illus. 1).—These papers record measurements of stream flow for the year ended September 30, 1944, No. 1004 covering the St. Lawrence River Basin; No. 1007, the lower Mississippi River Basin; No. 1009, the Colorado River Basin; No. 1010, the Great Basin; No. 1011, the Pacific slope basins in California; and No. 1014, the Pacific slope basins in Oregon and lower Columbia River Basin.

Quality of surface waters of the United States, 1943, C. S. HOWARD and S. K. LOVE (*U. S. Geol. Survey, Water-Supply Paper 970* (1945), pp. 180+).—This report of analyses is concerned only with waters in the south Atlantic slope and eastern Gulf of Mexico basins the lower Mississippi River Basin,

the western Gulf of Mexico basins, and the Colorado River Basin. The data given include for each sample some or all of the following: Suspended matter, oxygen consumption, color, specific conductance, silica, iron, calcium, magnesium, sodium, potassium, bicarbonate, sulfate, chloride, fluoride, nitrate, dissolved solids, and total hardness as CaCO_3 .

Water levels and artesian pressure in observation wells in the United States in 1943.—Part 5, Northwestern States, O. E. MEINZER, L. K. WENZEL, ET AL. (*U. S. Geol. Survey, Water-Supply Paper 990 (1946), pp. 279+, illus. 5*).—This part covers the States of Colorado, Idaho, Montana, Oregon, Utah, Washington, and Wyoming.

Linings for small irrigation ditches, W. E. CODE (*Colo. Farm Bul. [Colorado Sta.], 8 (1946), No. 2, pp. 2, 14-15, illus. 2*).—Lining a small irrigation ditch with concrete (thicknesses of 2, 2.5, and 3 in.) saved 91 to 95 percent of the water formerly lost through seepage. Road oil and bentonite linings saved 70 and 65 percent, respectively. Irrigating was made easier. All linings were in good condition after 1 yr., although holes appeared in the road oil lining, apparently caused by birds picking out grasshopper eggs.

In the preparation of the concrete linings, difficulty in trimming the sub-grade to exact shape was encountered even when a template for the outside shape was used. This difficulty was overcome by means of a trimmer, rotating on a true center, with which the final inch of earth was removed. A troweling tool of semi-circular cross-section and made, like the trimmer, to swing on a true center, was devised for the smoothing of the inner surface of the concrete lining. Its use reduced the number of irregularities causing turbulence of water flow. Both tools were controlled by two-by-four lumberstrips laid to line and grade along the sides of the ditch.

The sawmill scale (index) board, R. C. JOHNSON. (Coop. U. S. D. A. et al) (*Michigan Sta. Quart. Bul., 28 (1946), No. 3, pp. 181-188, illus. 3*).—The scale (or index) board here described is a modification designed to improve upon the accuracy and adaptability of existing equipment, and to be relatively simple and economical to construct. It is considered to afford a good starting point for the improvement of small sawmills, especially those producing softwood lumber or custom-sawed hardwood lumber for building purposes, but to have less application in the sawing of grade hardwood lumber (usually marketed random width). Improvements include the following: (1) the movement of the index pointer 2 in. for each inch movement of the knee, brought about by the pulley ratio. This device makes it possible to double the base scale of the index ruler so that the inch marks are actually 2 in. apart. (2) The tongue and grooved slip sticks between the inch scales are marked to indicate the number of boards of various thicknesses to the knee or to any desired last board thickness. (3) A window device shows the distance from the face of the knee to the saw. (4) Both the slip sticks and the glass or celluloid of the window frame are quickly removable to permit insertion of new combinations of lumber thicknesses or saw kerf changes.

Detailed instructions for building the new form of scale board are given.

Electric welding saves on cost of steel building frames (*Wisconsin Sta. Bul. 468 (1946), pp. 17-19, illus. 2*).—"Site welding" (electric welding of frame members, etc., at the building site) was found to effect a cost saving great enough so that steel framework for farm buildings may come into common use. It is pointed out that the new plan eliminates fabrication plant costs and lowers the heavy freight charges for transportation of bulky prefabricated roof trusses. Labor costs are also lowered. The trusses used in a new barn at the university farms were made up with an average of 2 man-hr. labor, compared with 10.5 man-hr. for bolted trusses.

What's ahead in flame weeding, F. B. WRIGHT. ([N. Y.] Cornell Expt. Sta.). (*Farm Res. [New York State and Cornell Stas.]*, 12 (1946), No. 2, pp. 1-2, illus. 1).—The experiments here discussed were made with a liquid-fuel type of flame cultivator, though a machine illustrated and described is of the gas-fuel type, burning a propane-butane mixture, provided with burners arranged in pairs for cultivating two rows at a time and equipped also with a hydraulic lift to handle the burners and runners.

In the trials carried out at Ithaca, the best results were obtained with corn, as when this was several inches higher than the weeds it was possible to kill practically all the weeds with no injury to the crop. Spinach, on the other hand, was found more sensitive to heat than most weeds, so that even small weeds could not readily be killed without damage to the spinach. The makers' claim that killing the first crop of weeds without so disturbing the soil as to bring more weed seeds up into the germination zone prevents further weed growth for the season was in some measure substantiated in the experiments. The machine used could be run by one man at from 2.5 to 5 miles per hour, permitting the coverage of large acreages in a day; the burner fuel consumption was from 5.5 to 6 gal. per hour; and "with improvements in the design of the machine it may be entirely possible to destroy weeds successfully and economically in more New York State crops than these tests indicate. The machine might also be useful for thinning crops and cleaning weeds out of nurseries."

Barn cleaners help mechanize chores (*Wisconsin Sta. Bul.* 468 (1946), pp. 19-20, illus. 1).—Various types of gutter-conveyor cleaners are briefly discussed, the conveyor dropping the litter, in all types, onto an elevator which loads it into a spreader. A small model of a type of conveyor making a complete circuit of a rectangular gutter layout, and a scoop cleaner, drawn along the gutter by electric power but pulled back by hand, are also noted.

Complications can occur in barn-drying hay (*Wisconsin Sta. Bul.* 468 (1946), pp. 20-21).—A new type of lateral duct, designed to prevent plugging of the vent with hay and dust, is described. The new duct is mounted at least 6 in. above the floor and the air vent consists of a 2-in. slot along the bottom of the duct. In three barns this duct permitted air flow from the duct into the hay with very little loss of pressure. Errors in barn hay-drying practice causing trouble under Wisconsin conditions included cutting chopped hay into too short a length, too high a moisture content in the hay when put up (indications being that it should not exceed 35 percent), putting in too great a depth of hay at one time, and failing to provide an air intake from fresh, dry outside air. It appeared that a depth of 8 ft. may be too great when the hay is quite green and chopped, or the weather rainy.

Hay drying (*Massachusetts Sta. Bul.* 428 (1945), p. 32).—Barn-curing of hay in 1944 was successfully carried out over ducts placed on the barn floor. About 40 tons of hay, of which the greater part was put into the barn at a moisture content of 45 percent, "was cured satisfactorily, and indications are that this system can be used in New England with considerable success." A set-up for curing baled hay has been added.

Cranberry storage investigation (*Massachusetts Sta. Bul.* 428 (1945), p. 32).—Berries were stored at 45° F. both in a normal atmosphere and in air of which the oxygen content had been reduced to 10 percent and the carbon dioxide content raised to 10 percent; others, in an air-cooled screenhouse. Of berries picked and stored September 9 and tested by screening on October 6, the losses were as follows: The 45-degree room, normal atmosphere, 4.4

percent; 45° room, controlled atmosphere, 2.9 percent; screenhouse, 7.1 percent. Berries stored in the controlled atmosphere had colored less than those stored in normal atmosphere. In the rooms designed to be held to 45°, actual temperatures reached 53° between September 14 and 25 because of power cut-off due to hurricane.

Home freezers, A. HUSTRLID and J. D. WINTER (*Minn. Farm and Home Sci. [Minnesota Sta.], 3 (1946), No. 2, pp. 1, 10-11, illus. 4*).—The authors give a limited discussion of the principles which must be considered in low-temperature cabinet construction in order to have a satisfactory installation.

The accepted storage temperature for frozen food is 0° F. Any equipment must, therefore, be designed to maintain this temperature under all conditions of the surroundings. Cabinets with top-opening doors are easier to construct than those with side-opening doors. They also possess the advantages that very little warm air enters when the door is opened and that the doors need not be as carefully made and cheaper hardware can be used. On the other hand, the side-opening cabinet makes possible a better interior arrangement with easier accessibility. Cabinet capacity depends on the number of persons in the household, food habits, individual tastes, and whether or not the family is a producer of livestock, fruits, and vegetables. Surveys show that people generally buy or build units which are too small. A farm family should plan for 5 to 6 cu. ft. for each person in the household, including hired men. In any case, it is not economical to build a unit with a capacity of less than 25 cu. ft.

In the construction of a freezer box one of the most important features, is an efficient vapor barrier installed on the warm side of the insulation. Doors should fit well and a rubber gasket should be installed around the edges as a sealing seat and to prevent sticking. Sturdy rust-resistant hardware should be used for the side-opening doors, but ordinary barn-door hinges can be used on the top-opening box. Woods that do not give off contaminating odors should be used for the wood framing. Pine, fir, spruce, and hemlock are satisfactory. The outside of the box should be painted. Aluminum paint in a spar varnish vehicle gives a satisfactory and attractive finish. Paints for the interior should be of a special nonodor type.

The most economical thickness of insulation is determined by the relationship between cost of construction and heat transmission through the walls. Many good commercial insulating materials are available in rigid board and fill types. Refrigerating equipment is so designed to remove certain predetermined amounts of heat from the space maintained at a low temperature. A minute examination of the total heat load, namely, (1) leakage, (2) service, and (3) product loads result in an economic selection of equipment capacities to do the fixed job, and all factors in cabinet construction play an important role in the successful and economical operating experience of the special refrigerator installation.

AGRICULTURAL ECONOMICS

Current Farm Economics [April 1946] (*Cur. Farm Econ. [Oklahoma Sta.], 19 (1946), No. 2, pp. 25-50+*).—The usual discussion of the agricultural situation and tables of prices and price indexes are included, together with an article, Farm Returns from Pasturing Winter Wheat in Two Selected Areas of Oklahoma, 1944-45, by W. F. Lagrone (pp. 41-48) (coop. U. S. D. A.), analyzing the gain in weight and value of feeder lambs, yearlings, 2-year-olds, and beef cows, and selected costs and estimated gains and returns above costs per head and per acre for each of the different kinds of livestock.

Peacetime adjustments in farming: Possibilities under prosperity conditions (*U. S. Dept. Agr., Misc. Pub. 595 (1945), pp. 52+, illus. 17*).—This is a report prepared by the Department's Interbureau Committee on Postwar Programs in cooperation with the land-grant colleges. "Back of this national summary are 48 State reports, each representing careful work by a State Production Adjustment Committee—including in its membership production specialists, agricultural economists, extension workers, State statisticians, and other State and Federal agricultural workers who are thoroughly familiar with agricultural conditions in that State. The State-by-State appraisals of postwar farming possibilities under prosperity conditions were carried out by the same committees that have analyzed wartime production potentialities year by year. The information developed for the wartime studies served as background for the longer term analysis, 1943 being taken as representative of the war years." Part 1, Background, contains a general summary of the study and the principal conclusions. In part 2, Commodity Adjustments—Crop Production, the bench-mark acreage, yield, and production of each of the principal crops are analyzed in relation to wartime and prewar levels. Part 3, Commodity Adjustments—Livestock Production, is a similar analysis and discussion for different types of meat animals, poultry and eggs, and milk production.

Decline and recovery of European agriculture: World Wars I and II, N. JASNY (*U. S. Dept. Agr., Foreign Agr., 10 (1946), Nos. 4, pp. 50-55; 5, pp. 66-75, illus. 2*).—No. 4 discusses the decline and factors affecting it during each war. No. 5 discusses the recovery after World War I and factors that are affecting or will affect the recovery after World War II, and the possible rate and duration of the recovery in selected countries.

Foreign Agriculture [April 1946] (*U. S. Dept. Agr., Foreign Agr., 10 (1946), No. 4, pp. 49-64, illus. 2*).—In addition to the article noted above are an article on Agriculture of British Honduras, by C. H. Farnworth (pp. 55-64), and a note, Spanish Hops Self-Sufficiency Plan, by L. Corder (p. 64), describing the hops monopoly recently announced by Spain.

Farm management in Oneida County, 1942-1943, L. C. CUNNINGHAM and S. W. WARREN (*[New York] Cornell Sta. Bul. 330 (1946), pp. 28, illus. 5*).—More detailed analyses are made of the data for the 102 farms in Oneida County included in the study reported in Bulletin 818 (*E. S. R., 93, p. 635*). Tables are included and discussed showing for these farms the numbers and values of livestock, use of land, acreages and yields of crops, tenure of farmers, capital investment, receipts, farm expenses, labor income, and cost of producing milk. Analyses are made of the relationships to labor income and cost of producing milk of size of business, as measured by acres operated, crop acres, number of cows, and total work units; of labor efficiency, as measured by cows per man and work units per man; of rate of milk production per cow—seasonality of milk production and butterfat test; of crop yields—yield of hay per acre and crop index; of combination of enterprises—systems of farming, proportion of cow feed home-grown, and proportion of cows replaced annually.

"In the period of relatively favorable economic conditions in which this study was made, size of farm business had a more pronounced effect on labor income than did labor efficiency, the rate of milk production, or crop yields. The farmers whose businesses were good in each of several factors were the most successful. The seven farmers whose businesses were above average in size of business, labor efficiency, milk production per cow, and crop yields made an average labor income of about \$2,400, or twice the average of the

region." The eight farms with the four factors below the average had an average labor income of \$191. The average cost per 100 lb. of milk for the different groups were: The entire 102 farms, \$3; the 8 farms below average in the four factors, \$3.36; and the 7 with average or above in the four factors, \$2.59.

Vegetable production and marketing in Georgia mountain counties, N. M. PENNY (*Georgia Sta. Bul. 240 (1946), pp. 29, illus. 1*).—The objectives of the study were: "(1) To estimate the potential vegetable production capacity of the area; (2) to learn the present methods and practices in marketing; (3) to determine the kind and adequacy of present marketing facilities; (4) to ascertain the usual practices and labor requirements on snap beans, potatoes, and cabbage; and (5) to determine the costs of and returns from snap beans." The data were collected from the county agents, the cooperative purchasing and marketing organizations, private buyers, and 60 farmers in the eight counties covered. The area, the present acreages and production of vegetables, the possible acreages, the production operations, market outlets, marketing practices and facilities, facilities and operations of the cooperative organizations, and private buyers, etc., are described. Analyses for 1944 were made of the costs of growing, harvesting, and marketing snap beans, and of the labor requirements for beans, cabbage, and potatoes.

The estimated acreage of important vegetable crops in 1944 was 7,487 acres, of which 3,375 acres were in beans, 1,150 in cabbage, and 1,865 in potatoes. It is estimated the acreage in vegetables could be increased to about four times the present acreage with little change in farm organization in the area. The yields of beans obtained by 35 growers in 1944 averaged 94 bu. per acre. Growing costs were 54.3 ct. per bushel, harvesting costs 33.1 ct., and marketing costs 24.8 ct. Net returns averaged 45.8 ct. per bushel. "Net returns plus labor costs equaled 89.5 ct. per bushel return to labor."

Costs, returns, and practices in growing snap beans on Cumberland Plateau, 1944, H. J. BONSER and C. C. MANTLE (*Tennessee Sta., Agr. Econ. and Rural Sociol. Dept. Monog. 196 (1946), pp. 56+, illus. 21*).—The data on which the study was based were obtained mainly from 66 growers in the area. Officials of the canning company, the frozen food plant, and the cooperative bean auction association, county agents, etc., were also interviewed. The cultural practices, yields, and methods of marketing are described. The physical and labor inputs, cost of production, gross and net returns, and the factors associated with the profitableness of the enterprise are analyzed and discussed. Appraisals are made of the snap bean enterprise of the area from the standpoints of existing farm organization and of markets.

Questions and answers on Government inspection of processed fruits and vegetables, F. L. SOUTHERLAND and E. T. LINDERER (*U. S. Dept. Agr., Misc. Pub. 598 (1946), pp. 26+, illus. 19*).—Information regarding the purpose, operation, standards used, accomplishments, benefits, etc., of the Government inspection of processed fruits and vegetables is given through questions and answers, grouped under the headings: Why Government inspection; what is Government inspection; what are United States standards; how is inspection accomplished; how is labeling related to United States standards and inspections; and what is continuous inspection.

Organization and management of poultry farms in Massachusetts (*Massachusetts Sta. Bul. 428 (1945), pp. 6-7*).—Comparisons are made of net farm income, labor income per hen, egg production, cost of feed per dozen eggs, etc., as shown by poultry account records for 1942, 1943, and 1944. In

the comparisons, the farms were grouped by years, amount of income, type of poultry enterprise, etc.

Costs and returns for the turkey enterprise, E. G. MISNER (*[New York] Cornell Sta. Bul. 827 (1946), pp. 80+, illus. 1*).—Analyses and comparisons are made of the costs and returns on 30 farms for the year ended January 31, 1939, and on 32 farms for the year ended January 31, 1944. The analyses include costs and returns in raising turkeys, costs and returns from breeders, cost of incubation, costs and returns per farm, and costs for young stock. A table compares the business factors for the turkey enterprise. Among other items analyzed are number, breed, and value of breeders; eggs laid, incubated, sold for hatching, and used; number, breed, and value of poults started; mortality; and charges for use of buildings and equipment.

The net cost of raising a turkey per pound of live weight was 21.4 ct. in 1938 and 37.6 ct. in 1943. Feed comprised about one-half, labor charge about one-fifth, and cost of poults about one-sixth of the cost. The average price received by the growers studied in 1938 for market turkeys alive was 25.3 ct. per pound. The Office of Price Administration ceiling price in 1943 for live turkeys on the farms studied was 35.3 ct. per pound. The average price received for dressed turkeys was 31.8 ct. per pound in 1938. At the O. P. A. ceiling price in 1943, the average price was 41.9 ct. After other costs were met, the return for labor amounted to 11.6 ct. per pound of live weight in 1938 and 7.3 ct. in 1943. In 1938 the cost for breeders amounted to \$8.26 per breeder, or 30.36 ct. per hatching egg produced. The cost in 1943 was \$8.25 per breeder, and 21.7 ct. per hatching egg. Excluding value of eggs incubated, the net cost of incubation in 1938 was \$51.66 per 1,000 eggs, or 8.6 ct. per poult hatched. In 1943 the cost was \$50.02 per 1,000 eggs, or 9.5 ct. per poult hatched.

Estimated gross cash income to Ohio farmers from the sale of agricultural products and from Agricultural Adjustment Agency payments, by counties—1943 and 1944 (*Ohio State Univ. and Sta., Dept. Rural Econ. Mimeog. Bul. 190 (1945), pp. 22+*).—A continuation of the series (E. S. R., 90, p. 540).

Citrus fruits: Production, farm disposition, value, and utilization of sales, crop seasons 1909–10—1943–44 (*U. S. Dept. Agr., Bur. Agr. Econ., 1945, pp. 44+, illus. 1*).—Tables by States and for the United States show by crop seasons 1909–10 to 1943–44 the production, farm disposition, value, and utilization of sales of oranges, grapefruit, lemons, and limes.

World trends in major oil crops, P. L. HANSEN (*U. S. Dept. Agr., Bur. Agr. Econ., 1946, F. M. 54, pp. 62+, illus. 5*).—The past trends, current changes, and prospective developments in the production of each of the major oil crops are discussed, with tables showing the production and net exports by countries or areas, usually for the periods 1909–13, 1924–28, 1929–33, and 1934–38, and the author's estimate for about 1955. A general discussion includes such subjects as the nature of world competition in oils and fats, relative importance of oil meal and oil from different oil crops, the major oil crops, the leading oil-crop areas, production trends before the war, the relative yields of tropical and Temperate Zone oil crops, the impact of the war, prospective trends in production, and what an expanded world production will mean to the United States.

"The world trend in production of the major vegetable oils has been strongly upward since before the First World War. This movement has been particularly pronounced for palm, palm-kernel, and coconut oils which are produced in the tropics. . . . Looking ahead, total world production of the major oil crops may reach a level about one-third higher than that of the 5-yr. period

1934-38 by the end of the first decade following World War II, if conversion to settled peacetime conditions is successful and if a continuing condition of world prosperity prevails. The world net export of major oil crops may also expand considerably by 1955, perhaps about 20 percent. The higher rate of expansion is estimated for world production because of large increases in oil production in several important countries, which will be on a net import basis or will have a very small increase in net exports. India, China, and the United States are leading examples."

Labor requirements for California crops: Major seasonal operations based on estimated acreages and production for 1945, M. W. LENHART (*Berkeley 4: Calif. Agr. Col. Ext. Serv., 1946, pp. 17+*).—The included tables summarize: (1) By weeks, by areas and counties, and by different crops, the approximate number of workers required each week in 1945, and the total man-weeks of labor during the year; (2) similar information for different crops by counties; and (3) for the State, the number of laborers by weeks, and total man-weeks of labor during the year in the major nonfarm packing establishments.

Wages and wage rates of seasonal farm workers in USDA labor supply centers at Arvin; Linnell, and Shafter, California, June 1945, W. H. METZLER (*U. S. Dept. Agr., Bur. Agr. Econ., Surveys Wages and Wage Rates in Agr., Rpt. 6 (1945), pp. 19+, illus. 1*).—This sixth report of the series noted above is based on a survey of workers housed in three of the five U. S. D. A. labor supply centers in the southern part of the San Joaquin Valley in California.

Wages and wage rates of farm workers in the citrus harvest, Los Angeles area, California, April-June 1945, W. H. METZLER (*U. S. Dept. Agr., Bur. Agr. Econ., Surveys Wages and Wage Rates in Agr., Rpt. 5 (1945), pp. 21+, illus. 1*).—This fifth report of the series (*E. S. R., 94, p. 673*) covers the periods April 23 to May 5 for the lemon harvest, and June 6-23 for the Valencia orange harvest.

Agricultural Finance Review [November 1945] (*U. S. Dept. Agr., Bur. Agr. Econ., Agr. Finance Rev., 8 (1945), pp. 104+, illus. 6*).—Articles as follows are included: Short-Term Agricultural Loans of Commercial Banks, 1910-45, by N. J. Wall and L. A. Jones (pp. 1-14); Property Tax Developments Since 1932, by P. E. Malone (pp. 15-21); Federally Sponsored Farm-Mortgage Credit Agencies—Wartime Operations and Postwar Prospects, by D. C. Horton and H. C. Larsen (pp. 22-34); Historical Sketch of Farmers' Mutual Fire Insurance, by V. N. Valgren (pp. 35-42); and Financial Mechanisms Used by the Commodity Credit Corporation, by R. J. Burroughs (pp. 43-52). Several short statements and a statistical appendix, with 30 tables covering farm-mortgage credit, non-real-estate credit, farm cooperative credit, farm taxation, agricultural insurance, and related items are also included.

Loan performance on low income farms in Massachusetts (*Massachusetts Sta. Bul. 428 (1945), p. 5*).—From 1936 through 1943, the U. S. D. A. Farm Security Administration made 89 loans on cash-crop farms and 95 on livestock and livestock-crop farms. By June 1945, 66 of the farmers in the first group had paid their loans in full, 13 were classed as active borrowers who had received loans within the last 2 yr., 5 were collection cases, and 5 had defaulted after making some payments. For the second group, the respective numbers were 53, 25, 11, and 6.

Twelfth annual report of the Farm Credit Administration, 1944-45 (*U. S. Dept. Agr., Farm Credit Admin., Ann., Rpt., 12 (1946), pp. 123+, illus. 1*).—This report to the House of Representatives, which continues the series (*E. S. R., 93, p. 634*), covers the operations of the production credit system, the Federal intermediate credit banks, banks for cooperatives, the farm mortgage

credit system, the emergency crop and feed loans, the Regional Agricultural Credit Corporation, the Agricultural Marketing Act revolving fund, loans to purchase stock in agricultural credit corporations, joint stock land banks, the central office of the Farm Credit Administration, and the Cooperative Research and Service Division of the Administration. Details regarding the operations of all the organizations, as well as statistics on farmers' cooperatives, are included in the appendix (pp. 55-123).

Wheat crop insurance in Tennessee and United States, B. D. RASKOFF and E. B. FICKLE (*Tennessee Sta., Agr. Econ. and Rural Sociol. Dept. Monog. 197 (1946), pp. 36+, illus. 12*).—The development and organization of the Federal crop insurance program are described, and the principal provisions of the wheat insurance contract summarized. Analyses are made for the years 1940-43 for Tennessee, with comparisons with other States, of the participation, premium rates, percentage of farms receiving indemnities, indemnities paid, etc. Factors that should be considered in estimating losses are discussed. "Federal crop insurance, available to all Tennessee farmers on the wheat crops of 1940 to 1943 and 1946, was carried by 6,440 farmers. This represents an average participation in the program by wheat producers of less than 5 percent. Below 6 percent of the total wheat allotment acreage has been insured in any one year. . . . The proportion of farms insured receiving indemnities, for the State as a whole, averaged 10 percent over the 4-yr. period 1940-43. Indemnities paid, expressed as a percentage of insured production in bushels per acre, averaged 3.7 percent for the 4-yr. period."

Inheritance of farm real estate, 1920-1945: A list of references, A. M. HANNAY (*U. S. Dept. Agr., Libr. List 22 (1946), pp. 34*).—A bibliography containing 219 selected references on inheritance of farm real estate in the United States and foreign countries. A few references to general inheritance are included.

Co-operative organisations and post-war relief. (*Internatl. Labor Off., Montreal, Studies and Rpts., Ser. H, No. 4 (1944), pp. 173+, illus. 2*).—Part 1, Characteristics of the Cooperative Movement (pp. 4-36), "deals with the nature of cooperative association and examines the structure of the cooperative movement and certain organizational tendencies within it." Part 2, Co-operative Organizations Throughout the World (pp. 37-82), "provides a rapid survey of the manifold types of cooperative organization and gives the necessary information on their number, size, geographical distribution, and other features." Part 3, Cooperative Organizations in Relief Operations (pp. 83-144), "considers the possible role of the cooperative movement in the immediate postwar problem of relief. After a brief introductory chapter, it deals in turn with the cooperative distributive network in Europe, the cooperative sources of supply outside Europe, and the overseas connections of the European consumers' cooperative organizations."

The co-operative movement and present-day problems, with special reference to rehabilitation and reconstruction (*Internatl. Labor Off., Montreal, Studies and Rpts., Ser. H, No. 5 (1945), pp. 232+*).—This study is a sequel to the one noted above. Part 1, Restoration of Basic Economic Functions (pp. 5-100), "analyzes the possibilities of cooperative action in the restoration of basic economic functions—agricultural production, fisheries, housing, transport, power, etc." Part 2, Social Problems of Rehabilitation (pp. 101-171), "is devoted to some of the social problems of rehabilitation—employment, improvement of standards of living, democratic management of the economy." Part 3, Conditions and Forms of the Cooperative Contribution to the Rehabilitation and Reconstruction Effort (pp. 173-221), "examines the conditions

under which and the forms in which the cooperative movement can most effectively contribute to the solution of some of the problems of the present and of the immediate future."

Research practices and problems of farmers' regional associations, M. A. ABRAHAMSEN (*U. S. Dept. Agr., Farm Credit Admin., Misc. Rpt. 96 (1946), pp. 73+, illus. 1*).—"In obtaining information as a basis for this study 13 farmers' regional purchasing associations were visited. . . . Managers and other key administrative officials were consulted relative to the nature and extent of research conducted by the associations they represented. Efforts also were made to obtain the views of these officials concerning possibilities for development of effective research programs. Depending upon the administrative organization of associations visited, in addition to managers, those interviewed usually included personnel in charge of the following departments: Feed, seed, fertilizer, petroleum products, farm machinery, miscellaneous farm and household supplies, manufacturing, purchasing, distribution, finance, credit, traffic, marketing of agricultural products, office management, and personnel." The several sections of the report discuss the meaning and importance of research for farmers' regional purchasing cooperatives, the research agencies available to farmers' regional purchasing cooperatives, the industrial and business research activities of such cooperatives, basic considerations in establishing effective research programs, and the application of research techniques to educational programs of cooperatives.

Proposals for reorganization of Bodega Cooperative Creamery Incorporated and Point Reyes Dairymen's Association, J. M. TINLEY and K. D. NADEN (*California Sta. Mimeog. Rpt. 86 (1946), pp. 38+, illus. 2*).—The two associations were organized about two decades ago to manufacture cooperatively butter and other dairy products. Due to the transition from the manufacture of milk products to the shipping of market milk and cream since 1938, less than half of the volume of milk received by the two associations in 1945 was used for manufacturing purposes. The present study was undertaken to make analyses of the economic conditions under which the two associations were operating, with a view to recommending possible plans for reorganization. The trends in the California dairy industry, 1924-45, and the operations of each of the associations are analyzed and described. Four plans of reorganization are suggested, and the advantages and disadvantages of each discussed.

Delivery efficiency of petroleum cooperatives affiliated with Southern States Cooperative, Inc., J. W. MATHER (*U. S. Dept. Agr., Farm Credit Admin., Misc. Rpt. 95-A (1946), pp. 100+, illus. 19*).—As a result of the increase in the use of power-driven farm machinery, 17 local farmers' petroleum cooperatives have been organized since September 1938, in Delaware, Maryland, Virginia, and West Virginia, and are affiliated with Southern States Cooperative, Inc., Richmond, Va. In connection with its postwar planning activities, the Petroleum Management Service of the Southern States Cooperative, Inc., requested this study of 10 of the affiliated local cooperatives. The report includes sections on economic factors affecting the petroleum service; efficiency of delivery operations, 1941-42 to 1943-44; organizing an efficient route system; facilities used in distributing petroleum products; the problem of loaning farm storage equipment; operating results and financial status of the cooperatives; and possibilities and problems of expanding petroleum service.

Delivering petroleum to farmers efficiently, J. W. MATHER (*U. S. Dept. Agr., Farm Credit Admin., Misc. Rpt. 95 (1946), pp. 15+, illus. 5*).—A condensation of Miscellaneous Report 95-A, noted above.

Financial operations of Ohio farmer owned elevators during the fiscal year 1944-45, B. A. WALLACE (*Ohio State Univ. and Sta., Dept. Rural Econ. Mimeog. Bul. 189 (1945), pp. 22+*).—A continuation of the series (E. S. R., 93, p. 790).

Prices paid by farmers during two wars, R. E. JOHNSON (*U. S. Dept. Agr., Bur. Agr. Econ., Agr. Situation, 30 (1946), No. 5, pp. 4-7, illus. 3*).—A chart with discussion compares by years, 1914-21 and 1939-45, the prices paid by farmers for all commodities, exclusive of interest and taxes, for family living and for farm production. Other charts make the comparisons for family living and farm production by groups of commodities.

RURAL SOCIOLOGY

Studies of rural social organizations in the United States, Latin America, and Germany, C. P. LOOMIS (*Ann Arbor, Mich.: Edwards Bros., 1945, pp. 392+, over 100 illus.*).—The bulletins and articles reproduced here have been assembled and published in the present form for classroom use. The book demonstrates the range of fields in which an investigator may be required to work over a period of 10 yr. in a government department.

Rural-urban migration and the marriage rate—an hypothesis, P. H. LANDIS. (Wash. Expt. Sta.). (*Amer. Sociol. Rev., 11 (1946), No. 2, pp. 155-158, illus. 4*).—"These data . . . suggest that migration across rural and urban lines is favorable to an early marriage, even in cases where the sex ratio is a decided liability. Migration to an area of unfavorable sex ratio increases the possibilities of a male's later marriage (after 25) and does not seem to hinder appreciably a woman's later chances of marriage (after 22). If this hypothesis seems untenable, the alternate hypothesis is that marriage itself is a factor producing migration."

The Negro population of Kentucky, H. W. BEERS and C. P. HEFLIN (*Kentucky Sta. Bul. 481 (1946), pp. 35, illus. 13*).—Negroes, only a small part of Kentucky's total population in 1940, were principally urban-dwellers. Next in importance as a place of residence was the rural nonfarm community. Farm communities had fewest Negroes. Since 1850, the Negro population has been growing steadily smaller as a part of the State's total population. In 1940 there were fewer Negroes in Kentucky than there had been at any other census year in the 80 yr. since 1860. The peak census year for Negro population was 1900. After that came steady decline. Since 1870 also the average age of the Kentucky Negro population has been rising. This has been due to a decrease in fertility, and to out-of-State migration of people in the younger-age groups, another factor incidentally which must have influenced fertility. Occupationally, Negroes were practically absent in the so-called middle ranks. They were numerous in the service, laborer, and operative class, and not conspicuously below the whites in the professional and semiprofessional classes. Clerical and sales categories had relatively few Negroes. In the class of farm operators, Negroes became relatively fewer from 1920 to 1940. From this study it is clear that treatment of any issue concerning Negroes in Kentucky requires recognition of several conspicuous trends and conditions—declining numbers, urbanward movements, declining birth rates, continuing out-migration, an increase in average age, an absence of Negroes in the middle ranges of the occupational ladder, a relatively low average level of school attainment, and a relatively low level of housing.

Rural health facilities in Missouri (*Missouri Sta. Bul. 491 (1945), p. 57*).—According to this study, records covering a year's experience for each of

1,500 families, or more than 5,000 persons, in five counties show that on the average each person was ill 41 days per year with an ailment that disabled him for his usual activities.

AGRICULTURAL AND HOME ECONOMICS EDUCATION

Report of the Committee on Higher Agricultural Education in England and Wales, T. LOVEDAY ET AL. ([*Gt. Brit.*] *Min. Agr. and Fisheries, Com. Higher Agr. Ed. England and Wales, Rpt., 1946, pp. 86*).—This is the report from which some recommendations have been noted (*E. S. R.*, 94, p. 848).

Developing a farm plan, J. H. SITTERLY and J. I. FALCONER (*Ohio State Univ. and Sta, Dept. Rural Econ. Bul. 187 (1945), pp. 33+*).—A set of forms designed for use in teaching farm organization and management in vocational agriculture schools.

An examination of livestock-judging courses, E. H. HUGHES, C. E. HOWELL, and S. W. MEAD. (*Univ. Calif.*). (*Jour. Anim. Sci.*, 5 (1946), No. 2, pp. 233-235).—Suggestions given in 45 replies to a letter of inquiry are classified, and 11 specific recommendations are offered.

The new home economics omnibus, F. L. HARRIS and H. H. HUSTON (*Boston: D. C. Heath and Co., 1945, pp. 666+*, about 200 illus.).—A revision and supplement of a previously noted text (*E. S. R.*, 86, p. 700).

The home demonstration agent (*U. S. Dept. Agr., Misc. Pub. 602 (1946), pp. 38+*, illus. 8).—The origin and development of home demonstration work and its place in the program of the cooperative Extension Service of the Department and the States are described. The activities of the home demonstration agent, the methods used in carrying on the work, and some of the achievements, especially during 1944, are described and discussed.

FOODS—HUMAN NUTRITION

Chemistry of food and nutrition, H. C. SHERMAN (*New York: Macmillan Co., 1946, 7. ed., pp. 675+*, illus. 47).—This seventh edition of this well-known text has been thoroughly revised, several chapters rewritten, and two new chapters added since the previous 1941 edition. The new chapters include: Nutritional Characteristics of the Chief Groups of Food and Causes and Extent of Variations in the Nutritive Values of Foods.

The discussions of nutritional needs and the tables of nutritive values have been revised in accordance with recent dietary recommendations and studies of food values. Many new data on the mineral and vitamin content of foods have been incorporated. The table on the vitamin value of foods gives the normal range of vitamin values likely to be found in most of the foods represented. The list of references and suggested readings have been greatly augmented to include a large number of recent articles of interest and importance in the different fields of nutrition.

Cereal-extended ground pork meat loaves: Their palatability, N. HOTALING and F. FENTON. (*Cornell Univ.*). (*Jour. Home Econ.*, 37 (1945), No. 10, pp. 629-638).—This study was made to determine the optimum extent to which several cereals could be substituted for meat in ground-meat loaves. Fresh, frozen, and canned meat loaves were studied for the purpose of reducing the time necessary for making a loaf of the maximum nutritive value with a minimum of ingredients. Soya flour and grits, oats, wheat kernels, and a mixture of equal weights of rolled oats, soya grits, and shredded wheat were the cereals used. Other ingredients, such as eggs, wheat germ, brewer's yeast, dried

skim milk, whole-wheat flour, and seasonings or monosodium glutamate, were added in varying amounts and combinations to 458.6 gm. of ground pork. Loaves made from the best 15 of the 50 recipes tested were frozen in the raw and precooked forms. Three mixtures were canned, and fresh meat loaves and thawed frozen loaves were baked.

Palatability tests were made, based on score cards, in which 5 percent was allotted for odor, 20 percent for surface appearance, 15 percent for consistency, 15 percent for moistness, 25 percent for flavor, and 20 percent for general acceptability. The formula is given for soy-extended loaf containing about 18 percent soya grits and having the highest nutritive value. The use of long-cooking rolled oats resulted in a higher scoring product than did the quick-cooking variety, with 10 percent rolled oats proving optimum. The wheat-extended loaves scores averaged less than the soy- or the oat-extended loaves, the flavor being less meat-like. Loaves made with a cereal mixture scored lower than did those with the soya grit extender but slightly higher than did those with the oat or wheat extenders. Palatability scores and formulas are shown for loaves containing varying amounts and forms of eggs (dried whole, screened, or collector powder), seasonings, water, fat, and temperatures. Except for one type each of the frozen oat- and wheat-extended loaves, the total scores were higher for the frozen loaves than for the fresh made with these ingredients. The frozen prebaked loaves had a desirable consistency in most combinations. Flavor scored high in the canned loaves, but the texture was rated poor. The yield of the baked soy-extended loaf was 80 percent.

Quality of eviscerated poultry obtained from defrosted, dressed stock, R. D. TRELEASE and C. H. KOONZ (*Food Res.*, 10 (1945), No. 5, pp. 373-378).—Aroma and flavor scores, made after four inspections of each of the 60 fryer-size battery raised birds studied, demonstrated that warm evisceration performed immediately after dressing was an excellent method for handling poultry in that visceral taints are not imparted to the edible tissues. The quality of the poultry was seriously impaired by visceral taints when defrosted-dressed poultry was held at 10° C. for 1 day or more prior to evisceration, and impaired to a lesser degree when the defrosted-dressed poultry was held at 2.2° for 1 day or more.

Flours from Missouri wheats for baking purposes (*Missouri Sta. Bul.* 491 (1945), pp. 45-47, *illus.* 3).—To ascertain the cake-baking performance of new and old wheat varieties for cake flours produced in Missouri, standard angel food cake formulas were used in tests, and the volume of the resulting product was noted. As standard control, a score of 100 was used representing the volume of an angel cake made from commercial cake flour, and the wheat varieties tested as follows: Fulcaster, 93; Early Premium, 92; Michigan Wonder, 91; Clarkan, 88; and Kawvale, 78. The same methods for measuring volume was applied in tests with white cakes and cookies. The results of the tests indicate that the variety of wheat influenced the quality of the flours.

A concentrated nutritious loaf (*Missouri Sta. Bul.* 491 (1945), pp. 47-48, *illus.* 1).—The objective of this study was to determine if a loaf of yeast bread could be made that would give nutritive value which would furnish one-half of the daily nutritive requirements of a moderately active man (N. R. C. standards). A formula was developed and sufficient bakings were made to produce an acceptable loaf made of enriched flour, dried whole eggs, dried whole milk, fortified margarine, and yeast. No chemical tests have been made to determine whether the finished loaf contained these values.

Bread baking quality of dry milk solids, O. E. STAMBERG. (Univ. Idaho). (*Baker's Digest*, 20 (1946), No. 2, pp. 31-32).—Skim milk, dried into powder

form by the spray and roller type processes, is a product now being used largely by the baking industry in the production of milk bread. Dry milk solids are classified into three groups: (1) Powders having low absorption and poor baking quality, (2) powders having fairly high absorption and poor baking quality, and (3) powders having high absorption and good baking quality, which group comprises the majority of the powders used for bread baking. A baking test is necessary to determine the bread baking quality of milk solids, although recording laboratory dough mixers and chemical tests are also used. Research shows that the proper heat treatment previous to drying is the main factor responsible for the absorption property of the milk solids. The casein portion of the milk proteins, constituting about five-sixths of the total proteins, is related to variations in the absorption of the dry milk solids. Usually 6 percent milk solids, as based on the quantity of flour, is recommended for the amount to be used in the production of milk bread. Whey proteins, constituting about one-sixth of the total milk proteins, are of importance in relation to that factor in unheated milk which affects the gluten structure adversely and thus produces poor quality bread.

Physical properties of starch from potatoes of different culinary quality, A. M. BRIANT, C. J. PEEBSONIUS, and E. G. CASSEL. (Cornell Univ.). (*Food Res.*, 10 (1945), No. 5, pp. 487-444, illus. 2).—Studies were made on the physical properties of starch extracted from 22 samples of potatoes of different degrees of mealiness. The distribution of particle size, determined by hydrometer analysis, was found to follow a sigmoid curve when the percentage of particles below a specified diameter was plotted against the diameter of the granules. Determinations showed that the temperature at which the first starch grains lost anisotropy ranged from 53.9° to 61.5° C.; final disappearance of anisotropy was found from 63.4° to 72.3°. Sixteen percent suspensions of starch, heated in a boiling-water bath, were found to thicken at temperatures ranging from 64° to 68.5° and became translucent at temperatures ranging from 65.1° to 70.8°. After allowing the starch pastes to cool their rigidity varied from 61×10^2 to 286×10^2 dynes per square centimeter, and penetration values ranged from 84 to 152 gm. The results of this study indicated that degree of mealiness of cooked potatoes may be associated with some of the physical properties of the starch of the raw tubers.

Investigations on the nutritive value of tapioca (*Manihot utilisima*), V. V. SREERAMAMURTHY (*Indian Jour. Med. Res.*, 33 (1945), No. 2, pp. 229-238, illus. 4).—Nitrogen was extracted from fresh tapioca roots by triple 15-min. extractions of 200-gm. portions of the ground root with 200 cc. of solvents such as water, 5 percent NaCl, 70 percent alcohol, or 0.2 percent NaOH. The amount of nitrogen left unextracted in the residue varied from 5.40 percent with 0.2 percent NaOH extractant to 16.78 with the water extractant. Protein fractions in the extracts were determined by precipitating with a number of reagents. Attempts, by five methods described, to isolate the protein in pure form from the water extract failed to yield a preparation of low ash content. Amino-acid composition of the tapioca protein was found to be: Arginine 17.0, tyrosine 1.6, tryptophan, 1.1, and cystine 1.3, expressed as percentage of the total N extracted. Analysis of the non-protein nitrogen in the water-extracted tapioca also showed fair amounts of these amino acids.

Digestibility experiments on the whole tapioca powder were made using two proteolytic enzymes. The results showed that tapioca proteins were readily proteolytic enzymes. The results showed that tapioca proteins were as readily digested by pepsin.

The digestibility of the carbohydrate in the finely powdered tapioca root

by taka diastase and by pancreatic amylase was studied; the latter enzyme was found to hydrolyze 48.3 percent of the carbohydrates in the raw state and 77.9 percent after cooking. The tapioca starch was digested to a greater extent by taka diastase than by pancreatic amylase.

Peanut butter improved by changing flavor and texture, J. G. WOODROOF, H. H. THOMPSON and S. R. CECIL. (Ga. Expt. Sta.). (*Food Indus.*, 18 (1946), No. 4, pp. 109-110, 218-224, illus. 1).—Essentially noted elsewhere (E. S. R., 94, p. 828).

Influence of supplementary calcium and magnesium fertilizers upon nutritive value of kale, A. D. HOLMES, L. V. CROWLEY, and J. W. KUZMESKI. (Mass. Expt. Sta.). (*Food Res.*, 10 (1945), No. 5, pp. 401-407).—Kale seed was sown directly on experimental plots and harvested 49, 51, 56, 59, and 63 days later. Plot A fertilized with a 4-9-7 commercial fertilizer served as control; in addition, plot B received magnesium sulfate; Plot C, magnesium sulfate and limestone; and plot D, limestone.

Assays were made for moisture, calcium, iron, magnesium, phosphorus, and carotene in the freshly picked kale samples. Results showed that the supplementary fertilizers had no effect on the carotene content of kale. Samples from plots B and C were higher in magnesium, and those from plots C and D higher in calcium and phosphorus than the control samples.

Vitamin content of field-frozen kale, A. D. HOLMES, B. V. MCKEY, K. O. ESSELEN, L. V. CROWLEY, and C. P. JONES. (Mass. Expt. Sta.). (*Amer. Jour. Diseases Children*, 70 (1945), No. 5, pp. 298-300).—The kale had been field-frozen seven times before being picked in the month of November. Assays for ascorbic acid, carotene, nicotinic acid, and pantothenic acid were made on the immature and extremely mature leaves.

Average results in milligrams per 100 gm. of kale on a fresh-weight basis were for ascorbic acid 212.2 and 158.6, carotene 5.6 and 6.3, nicotinic acid 2.21 and 1.94, and pantothenic acid 0.91 and 0.73 mg. for the immature and very mature leaves, respectively.

The authors emphasize that "these values supply evidence that field-frozen kale can contribute essential nutrients to the human diet, especially when the supply of fresh green leafy vegetables grown in this area is limited."

Factors in the preparation of maple cream, F. W. HAYWARD (*New York State Sta. Bul.* 720 (1946), pp. 8).—Maple cream is a soft fondant prepared from pure maple sirup by boiling rapidly until a temperature of 232° F. is reached. It is then quickly cooled to room temperature and stirred until crystallization is complete. It is principally used as a spread for waffles, pancakes, cakes, and sandwiches.

Recommendations given for the preparation of a maple cream of uniformly high quality include the use of good quality sirup with true maple flavor and with a low invert sugar content, rapid boiling to an accurately determined temperature, rapid cooling before stirring is begun, seeding with a little dry maple sugar immediately before stirring, and continual stirring or heating until crystallization is complete.

Experimental studies showed that when the amount of invert sugar present is over 3 percent, or if the final boiling temperature is under 232°, the cream becomes increasingly fluid and tends to separate.

How sugars affect dispersibility of pectins in gel powders, C. W. WOODMANSEE, G. L. BAKER, V. E. POLLARI, and W. G. MURRAY. (Del. Expt. Sta. et al.). (*Food Indus.*, 18 (1946), No. 3, pp. 100-101, illus. 3).—Further investigations are reported here relative to powdered gels with higher sugar concentrations than those previously described by Pollari et al. (E. S. R., 94, p.

534). Two types of sugar, namely, sucrose and dextrose, were used separately or in various combinations as a means of dispersing high-methoxyl intermediate-methoxyl, low-methoxyl apple pectins, as well as citrus pectin. From the volume-weight standpoint, a total sugar content of 60 percent in the finished gel represented the highest practical limit of sugars. On this basis, gel strength values with varying ratios of sugars and pectins were tested. A grainy texture developed when sucrose was used as the only sweetening agent. Variations in pH and type of pectin also influenced texture. Of various sugar concentrations used, dispersion of intermediate-methoxyl pectin was best in a 70 sucrose-20 dextrose combination with a sugar-pectin ratio of 90 : 1 and low pH value. Gels containing dextrose as the sole sugar showed surface crystallization in a short time.

Collected papers of the Canadian Committee on Food Preservation containing papers 55-108, with 2 appendices, II, 1940-1944 ([Ottawa?]: *Canad. Com. on Food Preservation*, [1945], vol. 2, pp. 567, illus. 124).—This collection consists of reprints of articles dealing chiefly with the preservation of meats, eggs, fish, and other perishable foodstuffs. Volume 1 of these papers appeared under the title *Collected Papers of the Canadian Committee on Storage and Transport of Food*.

Peacetime food compression, C. A. MAGOON et al. (U. S. D. A.). (*Food Indus.*, 18 (1946), No. 3, pp. 106-108, 216, 218, 220, illus. 3).—Bulk reduction of dehydrated foods by compression effects a saving in warehousing and transportation costs and is advantageous where high temperatures prevail and refrigeration facilities are limited. Compression processes do not materially affect the quality of the product if properly done. Vegetables with a low moisture content and low natural sugars become brittle when subjected to compression. Production of satisfactory compressed foods depend upon overcoming fragmentation; methods of processing for eliminating breakage are described. Satisfactory reconstitution depends upon the rapid disintegration of the food block—the degree of density varies with different products. Larger and thicker units require more time for reconstitution. Proper temperature and moisture content of the food and air-tight metal containers contribute to satisfactory storage. Considering the absence of waste, loss of storage, and convenience in use, the high prices of compressed dehydrated foods appear justified, providing the product is of high table quality.

Processing equipment used in emergency meat dehydration research by United States Department of Agriculture, W. A. NOEL, W. E. GRAY, O. G. HANKINS, and R. S. HOLLINGSHEAD. (U. S. D. A.). (*Food Res.*, 10 (1945), No. 5, pp. 379-391, illus. 12).—This paper discusses the types of processing equipment and operational procedures used in an investigation of meat dehydration. It is the first in a series of technical articles which describe all essential details of the various phases of a study previously reported in a somewhat condensed semitechnical form (*E. S. R.*, 92, p. 578).

Producing dehydrated meats by vacuum-rotary, plate-vacuum, and kettle-cabinet methods, C. F. DUNKER, O. G. HANKINS, and O. L. BENNETT. (U. S. D. A.). (*Food Res.*, 10 (1945), No. 5, pp. 445-456).—This article continues the above series, giving the details of three methods of producing dehydrated meats.

Producing dehydrated meats by drum-cabinet, retort-cabinet, and other methods, O. G. HANKINS, C. F. DUNKER, and O. L. BENNETT. (U. S. D. A.). (*Food Res.*, 11 (1946), No. 1, pp. 1-13).—This study completes the series on producing dehydrated meats.

The effect of wheat germ oil antioxidants and natural reducing substances on the stability of whole milk powder, R. A. CHAPMAN and W. D. MCFARLANE (*Canad. Jour. Res.*, 24 (1946), No. 1, Sect. F, pp. 47-60, illus. 6).—Storage trials of roller and spray-process whole-milk powders at various temperatures were made. The accelerated tests at 65° C. were found to give an accurate indication of the relative keeping qualities of the samples. Wheat-germ oil alone and in combination with citric acid and lecithin was effective in inhibiting oxidation catalyzed by copper contamination. "Reducing substances that develop in milk powders during storage in a moist atmosphere or at elevated temperatures are strong antioxidants and may offset the effect of added antioxidants. The riboflavin content of several powders with a high concentration of reducing groups decreased appreciably during storage."

The keeping quality of dehydrated mixtures of egg and milk, J. A. PEARCE, J. WHITTAKER, H. TESSIER, and W. A. BRYCE (*Canad. Jour. Res.*, 24 (1946), No. 1, Sect. F, pp. 70-76, illus. 5).—"The storage life of a dehydrated mixture of egg and milk, when assessed by both palatability and fluorescence measurements was shorter than the life of milk powder of similar protein, fat, and carbohydrate content. Increased quantities of egg in the mixture decreased the quality of the mixture, both initially and during 16 weeks' storage. These effects were noticeable at all temperatures studied between 40° and 140° F. but were most marked above 80°. After 16 weeks at 80°, material packed under carbon dioxide usually had better palatability than the air-packed products. The effect of added sugar was most noticeable at 120° and 140°. Lactose had a slightly beneficial effect; sucrose was more effective."

Dried whole egg powder, XVI-XIX (*Canad. Jour. Res.*, 23 (1945), Nos. 2, Sect. F, pp. 104-108, illus. 2; 4, pp. 239-242, illus. 2; 24 (1946), Nos. 1, Sect. F, pp. 39-46, illus. 2; 3, pp. 163-182, illus. 7).—In continuation of this study (E. S. R., 92, p. 729), three papers are presented.

XVI. *Relative stability of powders of different quality*, M. W. Thistle, W. H. White, D. A. Fletcher, and J. A. Pearce.—Samples of dried whole egg powder of varying initial qualities and origin were stored at 24° C. for 1 mo. Fluorescent materials developed at much the same rate in all samples studied. Samples stored at 24° for 4 mo. which had previously been heat-treated to provide definitely good, questionable, and poor samples showed that all qualities deteriorated at the same rate, regardless of moisture contents.

XVII. *Objective tests and baking quality*, M. Reid and J. A. Pearce.—"Potassium chloride value, refractometric value, the fluorescence of defatted egg powder in 10 percent potassium chloride, and the fluorescence of untreated dried material correlated equally well with the foaming volume of a mixture of dried egg, sugar, and water, and with the loaf volume of the sponge cake prepared from the powder ($|r|$ values from 0.81 to 0.90). A significantly closer relationship was observed between foaming volume and loaf volume ($r=0.96$). Since foaming volume was more precise and easier to determine than baking volume, it was concluded that foaming volume was a more desirable test of baking quality."

XVIII. *The keeping quality of acidulated, gas-packed powders of low moisture content*, J. A. Pearce, M. Reid, and W. H. Cook.—Investigations on the effect of acidifying liquid eggs prior to drying showed that no improvement of subsequent storage life occurred, although pH measurements revealed that powder from untreated egg became acid more rapidly. The storage life of the dried whole egg powder (as assessed by fluorescence tests) doubled when the moisture content was reduced from 4.7 to 3.0 percent, and tripled after a 4.7 to 1.7 reduction. "The maximum storage life predicted for the

low moisture powder by this test was only 36 weeks at 27° and 5 weeks at 88°. Palatability tests suggested that the product was somewhat less perishable, as a powder of 1.7 percent moisture was considered fit for use as an egg dish after 64 weeks at 27°. Gas-packing low moisture powders in an atmosphere of carbon dioxide appeared to be slightly more effective as a means of retaining palatability than packing in an atmosphere of air or nitrogen but was particularly effective in preventing loss of solubility (assessed by potassium chloride values) during storage."

XIX. *Accelerated storage tests to assess the effect of heat treatment, moisture content, and materials on the quality of dried sugar-egg mixtures*, R. L. HAY and J. A. PEARCE.—Dried egg powder (2.8 percent moisture), containing 33 percent sugar, and control samples of plain egg powder (3.9 percent moisture) were stored at 80°, 100°, 120°, and 140°F. for 7 days. At 140°, the sugar inhibited the initial fluorescence development; at 120° and lower, the sugar had a marked effect in retarding decrease in the quality of the egg powder, as assessed by fluorescence, potassium chloride, pH, and foaming volume measurements.

Dried egg powder containing 33 percent sugar was adjusted to moisture levels of 1.4, 2.8, and 3.2 percent and stored at 80° and 120° for 7 days. From the results obtained, it is recommended that sugar-egg powder be dried to the lowest moisture content compatible with the production of good quality powder, less than 2.8 percent and preferably 1.4 percent.

Loss in quality was less for sugar-egg powders (2.3 percent moisture) prepared with granulated sugar than those prepared with sucrose sirup when they were stored at 80°, 100°, 120°, and 140° for 7 days. Powder made from fresh shell eggs was more desirable than that prepared from frozen melange.

Making biscuits for canning, T. MALONE and J. KETCHEN (*Jour. Home Econ.*, 37 (1945), No. 10, pp. 640-641).—Using a basic recipe, 36 variations in proportions of single-acting and double-acting baking powder and animal and vegetable fats were combined for experimental purposes to determine the cause of rancid flavor and poor texture evident in home-canned biscuits. The experiment showed that vegetable fat produced a better canned biscuit than the animal fat, and single-acting was more satisfactory than double-acting baking powder.

Ration biscuits, II-III (*Canad. Jour. Res.*, 23 (1945), Nos. 2, Sect. F, pp. 123-131, illus. 3; 4, pp. 286-294, illus. 3).—In continuation of this series (E. S. R., 93, p. 219), two papers are presented.

II. *Effect of type and concentration of shortening on keeping quality*, G. A. Grant, J. B. Marshall, and W. H. White.—"Ration biscuits prepared by two manufacturers and containing 8 to 23 percent of one compound animal-vegetable and three all vegetable shortenings were stored at 43.3° C. (110° F.) for 86 weeks. Keeping quality was assessed by flavor, peroxide oxygen, and pH determination.

"The type of shortening was found to have a greater effect on keeping quality than the fat concentration or plant practice. Biscuits made with stabilized hydrogenated vegetable shortening were more stable than biscuits made with a compound animal-vegetable shortening. All biscuits became objectionable to the tasters after storage for 22 weeks."

III. *Effect of moisture content on keeping quality*, J. B. Marshall, G. A. Grant, and W. H. White.—Ground biscuits made with (1) a highly stable hydrogenated vegetable oil product and (2) with a much less stable, compounded animal-vegetable shortening were adjusted to moisture contents of approximately 0, 3, 6, 9, 12, 15, and 18 percent. After 56 weeks' storage at 43.3° C.,

keeping quality of these biscuits was assessed by flavor tests, peroxide oxygen, pH, and fluorescence measurements. Although the behavior was similar, and variations in moisture content had small effect on flavor scores, biscuit (1) gave differentially higher scores at moisture levels below 6 percent, indicating that a moisture content of 6 percent was most suitable for storage. The formation of the fluorescing substances reached a maximum at a moisture content of 12 percent and decreased at higher levels.

Microbiology of prunes during handling and drying, H. J. PHAFF, E. M. MRAK, R. ALLEMANN, and R. WHELTON. (Univ. Calif. coop. U. S. Army). (*Fruit Prod. Jour. and Amer. Food Mfr.*, 25 (1946), No. 5, pp. 140-141, 155).—Studies on the effect of commercial drying and handling practices on prunes showed that living yeasts or molds are not present after commercial dehydration. Sun drying, however, did not kill the yeasts on the fresh prunes, and they may possibly increase temporarily during the process. Poor plant sanitation enhanced recontamination during grading, but with improved sanitary conditions dried prunes with relatively few yeasts and molds were obtained.

Quality of canned orange juice, J. M. BOYD and G. T. PETERSON (*Indus. and Engin. Chem.*, 37 (1945), No. 4, pp. 370-373, illus. 1).—Investigations of the factors affecting the flavor of orange juice canned by commercial practices showed that subjecting the fruit to a hot water treatment of 1 to 2 min. at 180°-185° F. wilted the peel and reduced the amount of peel oil entering the juice during extraction. Juice extractors which could be so operated that appreciably little oil would be pressed out into the juice were found desirable for commercial application. Investigations of the juice showing a volatile oil content as low as 0.01 percent revealed that off-flavors developed on prolonged storage, while experimental packs with an oil content of 0.007 percent did not develop off-flavor after 18 months' storage. Further studies indicated that off-flavor in the juice, detected after these storage periods, was possibly due to other factors as well. Determinations made on the effect of oxygen on the juice indicated that extraction in the presence of inert atmosphere (nitrogen and carbon dioxide), deaeration prior to flash pasteurization, and filling by use of nonaerating equipment gave less off-flavor to the juice. Complete exclusion of head-space air decreased the flavor change, the loss of ascorbic acid, and the rate of can corrosion. The temperature to which the juice was heated during processing was a more minor cause of off-flavor than was the length of time it was held at elevated temperatures. Rapid cooling of the sealed cans to 100° or lower and storing at the lowest temperature practical to processors led to improved quality of canned orange juice.

Germans using improved methods to preserve fruit juices, Z. I. KERTESZ. (N. Y. State Expt. Sta.). (*Food Indus.*, 18 (1946), No. 4, pp. 80-82, 216, 218, illus. 3).—This article deals with the developments in the German fruit products industries during the war years. Unfermented fruit juices of improved quality were produced by methods unknown or unused in this country. These include mellowing by mold enzymes and storage in carbon dioxide under pressure.

Blanching and cooling for frozen pack, W. V. CRUESS. (Univ. Calif.). (*Fruit Prod. Jour. and Amer. Food Mfr.*, 25 (1946), No. 5, pp. 134-135).—Factory and laboratory experiments of blanching and cooling of various fruits and vegetables are summarized by the author. "(1) Water cooling and fluming is objectionable from the standpoint of loss of nutrients and damage to flavor. (2) Air cooling avoids these objections and appears to be practicable commercially."

Locker and home freezing of farm products, C. L. BEDFORD, J. A. BERRY, M. M. BOGGS, H. CAMPBELL, T. J. CUNHA, M. MCGREGOR, E. L. OVERHOLSER, M. F. POOL, D. G. SORBER, R. P. STRAKA, and B. M. WATTS. (Coop. U. S. D. A.). (*Washington Sta. Pop. Bul.* 180 (1945), pp. 46).—The rate of refrigerated-locker development in the United States has approximately doubled since 1940, with one-half billion pounds of foods frozen in 1943. The material in this bulletin, derived from suggestions and information available from research and industrial practice, deals with the special technics of food freezing of suitable farm products (fruits, vegetables, meats, poultry, and eggs). These include vegetable scalding by steam and boiling water, and dry and brine pack preparation procedures; and fruit sugar and sirup packs, and dry sugar and sirup pack preparations. Special directions are given for packaging, freezing, storage, care, and thawing of these foods.

Home freezing of fruits and vegetables (U. S. Dept. Agr., 1946, A1S-48, pp. 24, illus. 47).—This publication is a revision of a former booklet dealing with the preparation of vegetables and fruits for freezing (E. S. R., 91, p. 612). Illustrated steps for freezing corn, peas, broccoli, peaches, and strawberries are given, and other vegetables and fruits are listed with their specific preparation methods and scalding times noted. Information relative to washing, sorting, peeling, trimming, slicing, prevention of darkening, sweetening, chilling, packaging, container head space, and storage temperatures are discussed.

Committee on Food Research Conference on deterioration of fats and oils ([War Dept. U. S.], Army Serv. Forces, Q. M. Corps, QMC 17-7 (1945), pp. 153+, illus. 39).—This volume comprises the papers and discussions presented at the conference of the Committee on Food Research devoted to summarizing the present status of information pertinent to the Army's food problems. The papers presented at the several sessions gave a definition of the problem; discussed the mechanism of autoxidation reaction in fat; methods and their evaluation; factors affecting fat deterioration—including Pharmacological Considerations of Antioxidants, by H. O. Calvery, (pp. 113-114) (U. S. D. A.); and fat deterioration in food products other than separated fats and oils—including Toxicity of Rancid Fats, by F. W. Quackenbush, (pp. 149-150) (Ind. Expt. Sta.), and Fat Deterioration in Milk Products, by G. E. Holm (pp. 151-153) (U. S. D. A.).

Good food and nutrition for young people and their families, E. P. AMIDON, D. E. BRADBURY, and V. V. DRENCKHAHN (New York: John Wiley & Sons; London: Chapman & Hall, 1946, pp. 323+, illus. 32).—This book is an account of how the principles of good nutrition may help young people to eat correctly and of how they affect practices in marketing, cooking, gardening, and preserving foods.

[Nutritional status of aircraft workers in southern California].—[I], Diets of a group of aircraft workers in southern California, D. G. WIEHL (*Milbank Mem. Fund Quart.*, 20 (1942), No. 4, pp. 329-366), illus. 6.—This is the first in a series of articles dealing with an investigation begun at the Lockheed Aircraft Corporation, Burbank, Calif., in November, 1941. An analysis of the diet histories of approximately 1,100 workers was made by comparing the reported use of foods with those recommended in the dietary pattern prepared by the National Research Council.

Nutritional status of aircraft workers in southern California, II-IV (*Milbank Mem. Fund Quart.*, vols. 21 (1943), No. 2, pp. 115-157, illus. 1; 23 (1945), pp. 113-160, illus. 1; 24 (1946), No. 2, pp. 99-185).—Continuing the above series, these studies are presented.

II. *Clinical and laboratory findings*, H. Barsook, E. Alpert, and G. L. Keighley.—These examinations consisted of the following: Medical histories, physical examination, biomicroscopic examination of the conjunctiva and cornea, plasma ascorbic acid, serum protein concentration, hemoglobin, red cell count, red cell volume, and serological tests for syphilis. The reliability of some of the above tests as diagnostic methods of mild or chronic nutritional deficiency are discussed, and findings on the nutritional condition of the men at the time they were first examined are summarized.

III. *Effects of vitamin supplementation on absenteeism, turnover, and personnel ratings*, H. Barsook.—The first part of this report explains the position of this phase of the study and compares the workers with the general industrial population. It explains the nature of the vitamin supplement used, the nature of the placebo given one control group, the selection and composition of the vitamin and placebo groups, and the second control group selected to appraise the psychotherapeutic effect of a vitamin supplement as distinguished from the putative therapeutic. Part 2 presents the data on absenteeism, turnover, and Merit Review scores, and discusses the differences which occurred in these respects between the groups during the year of the study.

IV. *Effects of vitamin supplementation on clinical, instrumental, and laboratory findings, and symptoms*, H. Barsook, J. W. Dubnoff, G. Keighley, D. G. Wiehl, E. B. Goolden and J. G. Williams.—The clinical, instrumental, and laboratory findings at the end of a year's vitamin or placebo supplementation are compared with the findings in the two groups at the end of the study in addition to comparing each group with those before the supplementation was begun. On the basis of these data, the effects of the vitamin supplement on the physiological and anatomical conditions used for the appraisal of nutritional status, the psychological effects of the vitamin supplement and the placebo are appraised.

Nutritive value of dextri-maltose determined by the single-food choice method, C. P. RICHTER (*Soc. Expt. Biol. and Med. Proc.*, 59 (1945), No. 2, pp. 260-263, illus. 1).—Experiments using the single-choice method of determining the nutritive value of foods (E. S. R., 95, p. 136) have been continued. When dextri-maltose was fed as the sole source of nourishment 12 female rats survived, on the average, 85 days, as compared with 37 days when dextrose or sucrose was fed. This was 11 days longer than the survival time of rats fed dextrose plus thiamine hydrochloride (0.02 percent solution). The dextri-maltose fed rats had a higher food intake and lost weight less rapidly than the dextrose- and thiamine-fed rats. Their activities, water intakes, and vaginal smears were essentially the same. The author interprets the results to indicate that "dextri-maltose contains sufficient amounts of thiamine to utilize to its fullest available carbohydrate."

Nutritional studies with the duck.—I, Purified rations for the duck, D. M. HEGSTED and F. J. STARE (*Jour. Nutr.*, 30 (1945), No. 1, pp. 37-44, illus. 3).—On a highly purified diet composed of sucrose, vitamin-free casein (18 percent), salt mixture, corn oil, CaHPO_4 , cod-liver oil, choline chloride, and a vitamin mixture, ducks showed practically no growth until a liver extract was added. Purified liver extract, treated with alcohol to remove the biotin present was ineffective in promoting growth. Inclusion of biotin in the ration was necessary for normal growth. The extracted liver fraction could be replaced by a concentrate of "*L. [actobacillus] casei* factor." A deficiency in this factor resulted in anemia.

Additional amino acids, above those supplied by 18 percent casein, were necessary for good growth. These could be supplied in part by 0.5 percent arginine, or by 10 percent gelatin.

In biotin deficiency, no symptoms other than very poor growth were noted. The authors conclude that the nutritional requirements for the duck are apparently similar to those of the chick.

Nutritional studies with the duck.—II, Pyridoxine deficiency, D. M. HEGSTED and M. N. RAO (*Jour. Nutr.*, 30 (1945), No. 5, pp. 367-374, *illus.* 1).—Pyridoxine was excluded from the vitamin supplement in the ration described above in order to provide a pyridoxine-deficient diet. When day old ducklings were fed this ration, acute signs of deficiency appeared in a few days. The severe acute symptoms noted were growth failure and severe anemia (hemoglobin dropping to around 4 percent). No dermatitis or nervous disorders were noted in acute pyridoxine deficiency. Chronic deficiency, obtained with older ducklings (2-3 weeks old), was characterized by lack of growth, paralysis, convulsions, severe microcytic anemia, and poor feather development. This last was not thought to be due specifically to the lack of pyridoxine, but to some other deficiency of undetermined origin.

The pyridoxine requirements of young ducklings were found to be similar to that of chicks; approximately 250 μ g./100 gm. of ration.

Dental caries in the cotton rat.—III, Effect of different dietary carbohydrates on the incidence and extent of dental caries, B. S. SCHWEIGERT, J. H. SHAW, P. H. PHILLIPS, and C. A. ELVEHJEM. (Wis. Expt. Sta.). (*Jour. Nutr.*, 29 (1945), No. 6, pp. 405-411).—Various factors influencing the susceptibility of the cotton rat to dental caries have been investigated in this series of studies.

Technics previously reported (E. S. R., 94, 130) were used. The diet 802 (containing 67 percent of sucrose) has been modified by the substitution of various other carbohydrates—soluble starch, coarse or fine dextrin, glucose, maltose, dextrimaltose, fructose, and lactose. To insure better growth, 4 percent of a 1 : 20 liver extract was also added.

Results indicated that approximately the same rate of growth was observed when dextri-maltose, glucose, fructose, maltose, and sucrose diets were fed, but inferior growth occurred with fine dextrin, stock, or soluble starch rations. High incidence and extent of tooth decay were noted with glucose, dextri-maltose, fructose, maltose, or lacto-sucrose diets, but with the fine dextrin and coarse dextrin diets a very low incidence and extent of the lesions were observed. There was no appreciable difference in the results obtained when either coarse or fine dextrin were used.

The replacement of one-half of the sucrose with fine dextrin did not reduce the severity of tooth decay as compared to animals which received the sucrose diets. The replacement of three-quarters of the sucrose with fine dextrin reduced the incidence and extent slightly.

Dental caries in the cotton rat, IV-V. (Wis. Expt. Sta.). (*Soc. Expt. Biol. and Med. Proc.*, 59 (1945), No. 1, pp. 44-47, pp. 89-92).

IV. Inhibitory effect of fluorine additions to the ration, J. H. Shaw, B. S. Schweigert, P. H. Phillips, and C. A. Elvehjem (pp. 89-92).—Fluorine in amounts ranging from 22.5 to 450 p. p. m. was added to the basal ration 802 plus 4 percent 1 : 20 liver extract—dextrin or sucrose being the sole source of carbohydrate.

Results showed that at 22.5 p. p. m. level fluorine had no appreciable effect on the carious lesions produced on the sucrose diet. The inhibitory effect upon dental caries was progressively greater as the amount of fluorine rose from 45 and 90 to 135 p. p. m. Maximum effects were obtained at the 225 or 450 p. p. m. levels and caused a 90 percent decrease in caries incidence. Depigmentation effects began to appear at the 45 p. p. m. level, while mottling

of the third molars occurred at the two highest levels fed. The inhibitory effect of the dextrin diet upon the incidence of caries could not be explained on the basis of its fluorine content, which was only 1 to 2 p. p. m. while the fluorine content of sucrose averaged 3 to 4 p. p. m.

V. *Influence of strain variation on the caries susceptibility*, B. S. Schweigert, J. H. Shaw, C. A. Elvehjem, and P. H. Phillips (pp. 44-47).—The rats tested were obtained from the stock colony and from Florida and Michigan. On the usual cariogenic diet, wide variations in degree of susceptibility to dental caries was noted. Among the stock animals, certain rats and their inbred offspring gave evidence of increased resistance to caries when compared with more susceptible animals. In general, the offspring of the Florida and Michigan stock animals showed less susceptibility to dental caries than the susceptible Wisconsin strain. The results are considered to be statistically significant.

The need for manganese in bone development by the rat, M. O. AMDUR, L. C. NORRIS, G. F. HEUSER. ([N. Y.] Cornell Expt. Sta.). (*Soc. Expt. Biol. and Med. Proc.*, 59 (1945), No. 2, pp. 254-255).—Weanling rats were paired according to weights and fed low- and high-manganese diets. The feed consumption of the rat on high manganese was limited so that it gained weight at the same rate as its pair mate. Thirteen pairs of female and 5 pairs of male rats were studied, and the average results obtained are briefly tabulated. The authors conclude that the length, density, breaking strength, and phosphatase content of the bones of manganese-deficient rats were lower than in pair mates of the same weight receiving adequate manganese. No differences were found between the two groups in the percentage of ash, calcium, phosphorus, and magnesium in the fat-free dry bone.

Carbonate content of bone in relation to the composition of blood and diet, A. E. SOBEL, M. ROCKENMACHER, and B. KRAMER (*Jour. Biol. Chem.*, 159 (1945), No. 2, pp. 475-489).—These studies were carried out to determine whether a relationship existed between the carbonate content of bone and the composition of serum. Groups of rats were maintained on: (1) Low Ca-low P (basal) diet, (2) high Ca-low P diet, and (3) low Ca-high P diet. Paired litter mate rats were fed these diets with or without vitamin D supplement. Analyses were made of Ca, P, and CO_2 in serum and Ca and CO_3 in bone.

Results showed that the Ca and P content of the diet as well as vitamin D influenced the CO_3 : Ca ratio of bone. Changes in the ratio of bone CO_3 : Ca appeared to be related to serum CO_2 : P ratios. Bones of animals fed high calcium diet (2) showed a significantly higher CO_3 : Ca ratio than the other two groups. Vitamin D lowered the CO_3 : Ca ratio of the bones in the animals on all three diets.

The implications of these findings on the understanding of the mechanism of bone formation are discussed.

Composition of bone in relation to blood and diet, A. E. SOBEL, M. ROCKENMACHER, and B. KRAMER (*Jour. Biol. Chem.*, 159 (1945), No. 1, pp. 159-171).—The experiments described above were extended to include analyses of phosphorus, total base, and ammonia as well as calcium and carbonate in bone. The methods employed were those previously outlined (E. S. R., 92, p. 755).

In six out of seven experimental groups studied, the composition of bone showed an excess of base over that required by the calculated formula $\text{CaCO}_3 \cdot n [\text{Ca}_3(\text{PO}_4)_2]$. In the bone, the residual total base : P ratio ranged from 1.52 to 1.57, and the residual Ca : P ratio ranged from 1.48 to 1.52, whereas the theoretical residual total base : P ratio = 1.50.

Excess phosphate over that required by the above formula was demon-

strated in one group of animals and indicated the bone composition to have the empirical formula $[(\text{CaHPO}_4)_{1.6}(\text{Ca}_3(\text{PO}_4)_2)_2\text{CaCO}_3]$. In this group, the bone residual total base : P ratio was 1.36, and the residual Ca : P ratio was 1.33.

" n as measured by the PO_4 : CO_3 ratio in the bone appears to be correlated to the serum inorganic P : CO_2 ratios. n ranged from 1.86 to 3.83 in the various experimental groups. . . .

"The significance of these findings in the mechanism of the deposition of bone salt has been discussed."

The effect of fat upon the utilization of galactose by the rat, L. P. ZIALCITA, JR. and H. H. MITCHELL. (Univ. Ill.). (*Jour. Nutr.*, 30 (1945), No. 2, pp. 147-150).—Weanling rats were fed a basal ration consisting of 48 percent lactose, 20 percent ether-extracted casein, 4 percent salt mixture, and adequate vitamins. The remaining 28 percent of the diet consisted of either butterfat, corn oil, or glucose. With a galactose intake varying from 3.12 to 5.04 gm. of galactose daily, the average daily urinary excretion amounted to 30.7, 20.7, and 28.6 percent of the amount ingested on the butterfat, corn oil, and glucose diets, respectively. The authors conclude that "fats, as such, do not seem to be concerned in the metabolism of galactose. . . .

"Under the conditions of this experiment, corn oil, but not butterfat, decreases the urinary loss of galactose on a diet containing 48 percent lactose by about one-fourth. This may be an effect of some nonglyceride constituent of corn oil."

The effect of choline intake and environmental temperature on the excretion of choline from the human body, B. C. JOHNSON, T. S. HAMILTON, and H. H. MITCHELL. (Univ. Ill.). (*Jour. Biol. Chem.*, 159 (1945), No. 1, pp. 5-8).—Choline was assayed by the microbiological method of Horowitz and Beadle (E. S. R., 92, p. 8). Choline balance studies were made on four adult male subjects fed an adequate diet under "comfortable" and under "hot moist" environmental conditions.

With a choline intake averaging about 735 mg., only 0.7 to 1.5 percent of the intake was excreted as choline. No increase in total choline excretion was obtained under "hot moist" conditions.

Choline in undiluted sweat ranged from 2.7 γ to 15.30 γ of choline per 100 cc.

The utilization of choline analogues by cholineless mutants of *Neurospora*, N. H. HOROWITZ, D. BONNER, and M. B. HOULAHAN (*Jour. Biol. Chem.*, 159 (1945), No. 1, pp. 145-151).—Two mutants of *Neurospora*, strain 34486 (cholineless-1) and strain 47904 (cholineless-2), were found to differ in the gene responsible for the cholineless characteristic. A study was made of the biochemical reactions of the two strains with relation to choline and numerous related compounds.

Results showed that, in liquid media, cholineless-2 responded to much lower concentrations of most of the active compounds than the cholineless-1 strain. The authors adduced from this that the mechanism for choline synthesis in cholineless-2 is incompletely blocked. In agar media, the requirements for the two strains were reversed, but no explanation was found for this reaction.

Significant differences were noted in the ability of the mutants to utilize mono- and dimethylaminoethanol; cholineless-2 showing a higher requirement and smaller growth with both compounds than the cholineless-1 mutant.

Vitamin potency of pork as influenced by rations (*Missouri Sta. Bul.* 491 (1945), p. 49).—Swine were fed rations high in vitamin A and riboflavin, or low in riboflavin, and vitamin assays were made on the liver, kidneys, heart,

orain, loin, ham, and shoulder. Only in the liver was there any significant increase in the riboflavin content of those animals fed a high riboflavin ration.

The vitamin content of dehydrated eggs (*Missouri Sta. Bul. 491 (1945), p. 49*).—Rats fed fresh eggs, freshly dried eggs, or freshly dried scrambled eggs showed essentially the same rate of growth. Storage tests on dehydrated eggs were made at 35°–40°, 70°, and 100° F. After 6 months' storage, vitamin A losses amounted to 50, 50, and 82 percent, respectively, and after 12 mo. to 50, 67, and 88 percent.

Biological assays for thiamine showed values of 4.7 $\mu\text{g./gm.}$ dry weight for both fresh liquid and freshly dried eggs. After 3 months' storage at the temperature noted above, only those samples stored at 100° showed a loss (30 percent) of the original thiamine content.

A survey of the vitamins A and D potencies of the liver oil of Atlantic cod (*Gadus morrhua* L.), L. I. PUGSLEY, C. A. MORRELL, and J. T. KELLY (*Canad. Jour. Res.*, 23 (1945), No. 4, pp. 243–252).—Data on the vitamin A and D potencies of authentic samples of oil from the livers of codfish brought into ports in the Gaspé Peninsula, Nova Scotia, and New Brunswick showed that an increase in the vitamin A potency was paralleled by an increase in the vitamin D potency. An increase in the oil content of the liver and of the liver content of the fish was accompanied by a decrease in the concentration of vitamins A and D in the oil. Yields of the vitamins, expressed per 100 gm. of fish, indicated that there was no apparent seasonal change in potency other than those changes due to dilution. A relationship was observed between the stages in the spawning cycle and the oil content of the liver; fish do not feed during the spawning period, thus using the stores of fat in the liver. Fish classed as "steaks" yielded a liver oil higher in vitamins A and D potencies than "market cod," and the liver of "scrod" had the lowest vitamins A and D potencies.

The nutritional value of telang livers, P. L. PAVCEK, E. J. HERBST, and C. A. ELVEHJEM. (Wis. Expt. Sta.). (*Jour. Nutr.*, 30 (1945), No. 1, pp. 1–9, *illus. 2*).—Experiments previously reported (*E. S. R.*, 93, p. 517) are described in detail. The toxic symptoms produced by feeding telang livers to rats could be duplicated when standard stock rations or nontoxic livers were fed along with high doses (20,000 International Units per day) of crystalline vitamin A. Additional data are presented on the fat, mineral, and vitamin content of normal and telang livers. With the exception of iron and vitamin A values, no significant differences were found in the other substances studied. A range of 0.2 to 2.15 mg. of carotene and 15 to 30 mg. of ascorbic acid per 100 gm. fresh tissue is reported. On a dry-weight basis, other vitamin values given are choline, 1500 to 1600 mg.; pantothenic acid, 14 to 18 mg.; niacin, 40 to 50 mg.; and biotin 0.34 to 0.63 mg./100 gm. Fat content ranged from 15.0 to 27.6 percent, while copper values varied widely from 2.0 to 16.0 mg./100 gm. dry weight. In the telang livers, iron values ranged from 27.5 to 35.0 mg., while in normal livers the range was from 21.0 to 24.0 mg./100 gm. dry matter. Two-thirds of the telang livers had vitamin A values of 10 to 60 mg./100 gm. fresh liver, while a majority of the samples of the normal livers contained less than 10 mg. percent of vitamin A.

The nutritive value of snap beans (*Missouri Sta. Bul. 491 (1945), pp. 5–8*).—Snap beans were harvested from July to October. With increasing maturity, the following changes in vitamin values occurred: Carotene decreased; ascorbic acid increased, paralleling dry matter; and thiamine and nicotinic acid increased.

Prolonged cooking (8 hr.) of the snap beans destroyed 50 percent of the

ascorbic acid, but caused no appreciable destruction of the other vitamins if the cooking liquids were retained. Discarding the liquid from beans boiled 40 min. resulted in losses of ascorbic acid, thiamine, riboflavin, and nicotinic acid amounting to 67, 34, 30, and 35 percent, respectively. Little loss of B vitamins occurred in canning, whereas, 35 percent of the ascorbic acid was destroyed. Progressive loss of all vitamins occurred in storage of the canned beans. Home freezing procedures resulted in a 35 percent loss of ascorbic acid and 30 percent loss of thiamine. Dehydration produced nearly complete loss of ascorbic acid, but showed excellent retention of the other vitamins. Brining or pickling the beans caused practically total destruction of ascorbic acid. The salted beans, after soaking and cooking, retained 55 percent of the thiamine and 63 percent of the riboflavin present in the original beans. The pickled beans retained only about 20 percent of the B vitamins present in the raw beans. This study was directed by A. G. Hogan and L. M. Flynn with the assistance of S. Hulen and C. Bilbey.

Vitamin C and carotene in rose hips and products, O. E. STAMBERG. (Idaho Expt. Sta.). (*Food Res.*, 10 (1945), No. 5, pp. 392-396).—Studies were made on two varieties of rose hips—*Rosa spaldingii* and *R. megalantha*—harvested when green, orange-red, or red. Vitamin C assays were made by the colorimetric method of Loeffler and Ponting (*E. S. R.*, 89, p. 515).

In the rose hips, the meats represented about $\frac{2}{3}$ and the seeds $\frac{1}{3}$ of the weight of the fresh material. In the ripe meats, ascorbic acid values ranged from 1,105 to 1,498 mg. per 100 gm. and carotene from 30.3 to 38.3 mg. per 100 gm.

Rose hips, sealed in quart jars and stored at -20.6°C showed good retention of vitamin C over a 6-mo. period. A palatable jam was prepared and stored in a fruit cellar for 6 mo. The vitamin C value of the jam ranged from 106.3 to 125.5 mg. per 100 gm. and showed little loss on storage.

Juices and purees prepared from the rose hips, also were found to be high in vitamin C, palatable, and able to withstand storage in the ice box for several days with little loss of vitamin C.

The author recommends the use of rose hips in various fruit combinations such as fruit salads, sherbets, juices, jams, and jellies because of their high vitamin C and carotene content.

Stability of added vitamins in beer, F. M. YOUNGER and E. H. HARVEY (*Food Res.*, 10 (1945), No. 5, pp. 397-400).—Analyses of commercially produced beer of approximately 4 percent alcoholic content showed the following vitamin values per 12 fluid oz. bottle: Thiamine 0.008 mg., riboflavin 0.115 mg., and niacin 1.81 mg. The beer was fortified with 0.425 mg., 0.915 mg., and 19.5 mg. of thiamine, riboflavin, and niacin, respectively. It was then bottled in clear or amber glass, both of which were stored at room temperature in the light, while the amber bottles were also stored in the dark or in a refrigerator at 40°F .

Results showed that a 29 percent loss of thiamine occurred in the clear bottles stored in the light at room temperature for 6 mo.; no loss was noted in the other bottles. Riboflavin destruction amounted to 50 percent in the clear bottles during the first week of storage, and increased to 85 percent by 12 weeks. The corresponding amber bottles lost 40 percent in 12 weeks, while those stored in the dark or in the refrigerator each lost 23 percent.

No change in niacin values occurred under any of the storage conditions during the 6 mo. test period.

Physiological availability of the vitamins—study of methods for determining availability of vitamins in pharmaceutical products, B. L. OMER, D.

MELNICK, and M. HOCHBERG (*Indus. and Engin. Chem., Analyt. Ed.*, 17 (1945), No. 7, pp. 405-411, illus. 3).—In these preliminary studies various *in vitro* and *in vivo* disintegration tests and roentgenograms were compared with the bioassay technic (described below). This latter procedure measures the urinary excretion of a test dose of pure vitamin in relation to the excretion of a comparable amount of the vitamin ingested in food or in tablet form. Results showed that the bioassay test was a more accurate index of the physiological availability of the vitamins than the other methods.

The *in vitro* tests often showed incomplete disintegration of the vitamin tablet after digestion with gastric and pancreatic juices when chemical assay indicated that 99 percent of the water-soluble vitamins present were in solution. In other *in vitro* tests, showing nearly complete solubility of riboflavin, the urinary excretion test indicated that only 55 percent of the riboflavin present in that particular product was available. Certain B-complex vitamin capsules (containing fuller's earth) had only 40 percent of the thiamine content in a readily available form.

Tested by bioassays on rats, an indirect procedure has been proposed for the estimation of the availability of fat-soluble vitamins in multivitamin tablets. It is based upon the relative availability of the water-soluble vitamins in the same tablets.

Physiological availability of the vitamins, I-VI (*Jour. Nutr.*, 30 (1945), Nos. 2, pp. 67-88, illus. 1; 3, pp. 193-208; 4, pp. 225-238).

I. *The human bioassay technic*, D. Melnick, M. Hochberg, and B. L. Oser (pp. 67-79).—Using human subjects, a method has been devised to measure the biological availability of one or several of the water-soluble vitamins—ascorbic acid, thiamine, riboflavin, and nicotinamide. The urinary excretion of these vitamins as such or as their derivatives, was found to be directly proportional to the quantity consumed provided the subjects subsisted on an adequate diet. The linear dose-response relationship established by feeding the pure vitamins is the basis of the test for the availability of the vitamin in other forms (food or tablets).

Subjects (five or more) on an adequate vitamin intake were fed a prescribed adequate test diet, and the basal 24-hr. urinary excretion of the vitamin was assayed. A known amount of the pure vitamin was fed (immediately after the noonday meal), and the subsequent increase in the 24-hr. excretion of the vitamin was measured. After a 2-week period on a normal adequate diet, the test diet was again fed and excretion measured. The food containing approximately the same amount of vitamin (by chemical assay) as that previously tested in the pure form was then fed, and the difference in the vitamin excretion calculated.

The difference in the percentage of urinary excretion of the test substance in comparison with that excreted when equal amounts of the pure vitamin was ingested indicated the availability of the vitamin in that food. Results were considered to be as good or superior to those obtained in most animal assays.

II. *The effect of dietary thiaminase in fish products*, D. Melnick, M. Hochberg, and B. L. Oser (pp. 81-88).—The thiaminase in certain fish products (clams and herring) is capable of causing rapid and complete destruction of thiamine *in vitro* when incubated with certain food mixtures. More than eight times the minimal daily requirement of thiamine was destroyed when a homogenous mash of a daily ration was prepared to which both clams and thiamine had been added.

Human availability studies were carried out by the procedure outlined

above in which raw clams provided the thiaminase and heated clams served as controls. About 50 percent destruction of the ingested thiamine occurred in the gastrointestinal tract following the concomitant ingestion of raw clams. The use of the thiaminase of raw clams in the study of vitamin B₁ methodology, as well as its possible conditioning factor in certain kinds of malnutrition when raw or partially heated fish are consumed is discussed.

III. *The effect of dietary ascorbic acid oxidase*, M. Hochberg, D. Melnick, and B. L. Oser (pp. 193-199).—In vitro tests with diets containing substantial amounts of raw vegetables (cabbage, green beans, pepper, and carrot as well as tomato, cucumber, and lettuce) showed that most of the ascorbic acid was oxidized to the dehydro form by simple homogenization. Further incubation of the homogenized diet for 6 hr. produced a further conversion of over 60 percent of the dehydroascorbic acid to biologically inactive forms.

In vivo studies carried out as described in Part 1 indicated that the activity of the ascorbic acid oxidase is either destroyed or inhibited in the gastrointestinal tract. No greater destruction of either naturally occurring ascorbic acid or of added ingested ascorbic acid took place prior to absorption when active enzymes were present in the diet, comparable results being obtained on diets containing heat-inactivated or active ascorbic acid oxidase.

IV. *The inefficiency of live yeast as a source of thiamine*, M. Hochberg, D. Melnick, and B. L. Oser (pp. 201-208).—In vitro experiments were carried out with regular and high vitamin yeasts. Known amounts of thiamine were added to an aqueous suspension of the yeast cells, and the thiamine present in the solution or cell suspension was estimated by the thiochrome method. Results showed that a suspension of cells of nonenriched bakers' yeast was capable of removing nearly all of the added free thiamine from the solution. Cocarboxylase tests indicated that practically all of the absorbed vitamin was transformed to the phosphorylated form. In vivo experiments carried out as described in Part 1 supported these findings. In this study, an enriched live yeast was tested. The sample was found to have a large part of its thiamine in the free form and was practically ineffective in phosphorylating thiamine when in solution. In spite of these conditions, considered to favor the presence of available thiamine, only 17 percent of the total amount present in the yeast was found to be physiologically available. This lowered availability of thiamine could not be attributed to a slower rate of absorption of the vitamin from live yeast.

V. *The effect of copper on extra dietary ascorbic acid*, M. Hochberg, D. Melnick, and B. L. Oser (pp. 225-231).—In vitro studies showed that the addition of 7 mg. of copper to homogenized mixtures of a day's ration produced a slight destruction (approximately 20 percent) of the ascorbic acid present. This destruction was considered to be absolute as no further destruction occurred when 200 mg. of ascorbic acid was added to the mixture. Comparisons between blanched and unblanched samples of the diet indicated that the marked loss of ascorbic acid occurring in the unblanched mixture was due to the presence of ascorbic acid oxidase. As the addition of copper produced only slightly greater destruction of the total ascorbic acid present, the authors adduce that the ascorbic acid oxidase is a specific enzyme.

In vivo studies on humans showed that as much as 7 mg. of copper could be taken concurrently with 200 mg. of ascorbic acid without impairing the availability of the ascorbic acid present.

VI. *The effect of adsorbents on thiamine*, D. Melnick, M. Hochberg, and B. L. Oser (pp. 233-238).—Kaolin and fuller's earth, two commonly used adsorbents, were tested in the presence of thiamine by in vitro and in vivo as-

says. In vitro results showed that relatively small amounts of fuller's earth were capable of adsorbing all of the thiamine in the test solution. Similar amounts of kaolin (0.5 gm.) produced less complete adsorption.

Bioassay tests on humans, made to test the availability of the thiamine present in a B-complex capsule containing fuller's earth, showed that only 27 percent of the thiamine present was available to the human body. When similar tests were made with kaolin, taken postprandially and followed immediately by a test dose of thiamine, the thiamine was found to be 133 percent available when compared to a similar dose taken without kaolin. The authors, having found comparable greater-than-theoretical values in other experiments, conclude that thiamine can exhibit variable degrees of stability in the intestinal tract prior to absorption. Various materials ingested concurrently apparently are able to protect the vitamin during its passage through the gastrointestinal tract.

Effects of food intake and anoxia upon ascorbic acid excretion, acidity of urine, and survival of male albino rats, K. E. LANGWILL, C. C. KING, and G. MACLEOD (*Jour. Nutr.*, 30 (1945), No. 2, pp. 99-109).—Studies were made on the influence of diet upon the effects of anoxia induced by breathing a gas mixture low in oxygen at atmospheric pressure. Groups of male albino rats were fed "(1) dog chow alone, (2) a chow diet plus a daily supplement of 5 gm. of raw horse meat, (3) a chow diet plus a preexposure supplement of 2 gm. of sucrose, and (4) dehydrated carrots as the sole source of food." Incidence of survival, ascorbic acid excretion, pH, titratable acidity of the urine were noted.

Results showed that anoxia caused an increase in the pH of the urine and a decrease in titratable acidity, which was accompanied by polyuria. The ascorbic acid concentration of the urine varied inversely as the pH, a high pH being accompanied by a low ascorbic acid value. Increased alkalinity of the urine of animals fed a horse meat supplement, compared with animals fed chow alone, was not accompanied by protection of the animals against marginal lethal exposures to anoxia. A preexposure sugar supplement did not affect the altitude tolerance of rats on a chow diet.

When the consumption of chow was regulated equicalorically with the consumption of dehydrated carrots fed ad libitum, the two groups of animals survived severe anoxia almost equally well under some conditions of testing. In other tests where repeated exposures and more gradual ascent provided an opportunity for adaptation, there was evidence of added protection as a result of the carrot diet. The increased alkalinity, high potassium content, and low protein content of the carrot diet afford a tentative basis of accounting for the increased tolerance.

Biomicroscopy of the eyes in evaluation of nutritional status [Conjunctival changes and corneal vascularization], R. K. ANDERSON and D. F. MILAM (*Jour. Nutr.*, 30 (1945), No. 1, pp. 11-15, 17-24).—This study forms part of a previously reported survey (E. S. R., 93, p. 653) on nutritional status in a rural community in North Carolina.

Conjunctival changes.—Tabulated data are presented showing the severity and incidence of conjunctival changes detected with the slit lamp, the level of vitamin A found in the plasma, and the estimated daily dietary intake of vitamin A. No correlation could be established between the eye lesions observed and the dietary intake or plasma level of vitamin A. In general, the frequency and severity of the conjunctival changes were greater in the Negro than in the white subjects studied.

Corneal vascularization.—Similar lack of correlation was observed between

riboflavin intake and corneal changes. In general, more frequent evidence of corneal invasion was noted in the white than in the Negro subjects.

The amounts of vitamin B₁ in cereals and the extent to which they supply human requirements in various dietaries, W. I. M. HOLMAN (*Nutr. Abs. and Rev.*, 15 (1946), No. 3, pp. 387-410, illus. 1).—This comprehensive review presents data showing the effects of stage of growth, varietal differences, soil and environmental conditions, degree of milling, and storage on the thiamine content of the common cereal grains.

Data on the human requirements for B₁ are presented, and the proportions of cereals in various dietaries are tabulated. The contribution of cereals (in the diets of various groups) to the total B₁ requirement is estimated.

The bibliography contains over 200 references, most of them of recent origin.

The retention of thiamine, riboflavin, and niacin in cooking pork and in processing bacon, S. H. JACKSON, A. CROOK, V. MALONE, and T. G. H. DRAKE (*Jour. Nutr.*, 29 (1945), No. 6, pp. 391-403).—A study was made on the effect of variations in preparation, cooking, and processing upon the B vitamins in pork. Comparisons were made between cuts from different carcasses, cuts from the same carcass taken from opposite sides, different methods of roasting or frying pork, and various methods of processing bacon.

Average values per gram of raw pork loin or butt, respectively, were: Thiamine, 6.95 and 6.22 μ g.; riboflavin, 1.36 and 1.21 μ g.; and niacin, 26.3 and 30.8 μ g.

The pork butts were roasted correctly, underdone, or overdone. Average vitamin retentions were, respectively, 46.0, 57.5 and 36.8 percent for thiamine; 96.0, 105, and 92.0 percent for riboflavin; and 78.0, 94.0, and 75.2 for niacin. When loin pork chops were fried under similar conditions, greater retention of thiamine and niacin was noted, and considerably greater loss of riboflavin occurred. Correctly fried chops average 56.8, 76.9, and 96.6 percent retention of thiamine, riboflavin, and niacin, respectively.

Bacon samples were taken from the shoulder end of the full sides or back, or from the ham ends. One sample was wet cured and two samples were dry or box-cured following standard Canadian procedures. Values for the processed bacon averaged highest for the dry-cured back samples, being 7.37, 1.08, and 40.1 μ g./gm. bacon for thiamine, riboflavin, and niacin, respectively. Average values for wet- or dry-cured bacon sides were, respectively, 3.53 and 3.40 μ g./gm. for thiamine, 1.10 and 0.80 for riboflavin, and 21.9 and 22.3 μ g./gm. for niacin. Vitamin retentions for the wet- and dry-cure methods averaged, respectively, 74.1 v. 84.0 percent for thiamine, 89.0 v. 56.6 for riboflavin, and 80.8 v. 96.4 percent for niacin.

The authors conclude that prolonged cooking increases the loss of B vitamins. Frying gives a higher retention of thiamine than roasting.

The riboflavin, niacin, and thiamine content of dried leguminous seeds, L. DANIEL and L. C. NORRIS. (Cornell Univ.). (*Jour. Nutr.*, 30 (1945), No. 1, pp. 31-36).—Seventeen varieties of legumes were studied, including soybeans, split peas, blackeye peas, lentils, peanuts, lima beans, and several kinds of kidney beans (red and white kidney, pinto, pea, cranberry, pink and yelloweye, white marrow, Great Northern, black turtle soup, and Red Mexican). Two different methods were used to determine each vitamin in one sample of all legumes studied. Differences between methods averaged less than 5 percent in all cases. The routine methods finally adopted were the fluorometric method for riboflavin, the microbiological method for niacin, and the thiochrome method for thiamine.

Tabulated results show the average riboflavin content of legumes to be

rather constant, being highest in soybeans (average—3.3 $\mu\text{g./gm.}$) and ranging from 1.6 to 2.6 $\mu\text{g./gm.}$ in the other legumes studied. Little variation in niacin content was noted with the exception of peanuts, which average 136 and 157 $\mu\text{g./gm.}$ for the white Spanish and runner varieties, respectively. Other niacin values ranged from 18.1 for Red Mexican beans to 35.8 for green split peas. The average thiamine content ranged from 3.6 to 10.4 $\mu\text{g./gm.}$, being lowest in lima beans and highest in soybeans.

Failure of succinylsulfathiazole to aggravate egg white induced biotin deficiency in rats, G. A. EMERSON and E. WURTZ (*Soc. Expt. Biol. and Med. Proc.*, 59 (1945), No. 2, pp. 297–298).—Weanling male rats were fed biotin-deficient diets containing 15 percent egg white, certain groups receiving 2 percent dried beef liver and/or 0.75 percent succinylsulfathiazole in addition to the basal diet. In all cases, the addition of succinylsulfathiazole to these diets did not aggravate the signs of biotin depletion nor shorten the time required to produce the deficiency symptoms. When liver was contained in the diet, the addition of biotin was sufficient to produce normal growth. In the absence of liver in the diet, the addition of both biotin and a “folic acid” concentrate were necessary to produce good growth which was nearly equal to that obtained when liver was present in the ration.

Growth stimulants for microbiological biotin assay, V. R. WILLIAMS and E. A. FIEGER. (La. Expt. Sta.). (*Indus. and Engin. Chem., Analyt. Ed.*, 17 (1945), No. 2, pp. 127–130, illus. 3).—The *Lactobacillus casei* method of Shull et al. (E. S. R., 87, p. 626; 92, p. 8) for the assay of biotin was found to show a marked drift when used to assay certain rice products. Rice polish fractions, in particular, exerted considerable stimulatory action on the growth curve. By testing various extracts of rice polish treated by filtration, ether extraction, enzyme digestion, etc., the lipoidal nature of the stimulatory substance was established. Further studies with lecithin, mineral oil, oleic acid, and whole rice oil showed the latter two substances to be highly stimulatory. A less marked effect was noted with lecithin, while the results with mineral oil were uncertain. The use of these substances as supplements to the basal medium was not successful in improving the assay for biotin. No evidence of biotin synthesis could be found in tubes showing high acid and cell production in the presence of the basal medium and rice oil, but without added biotin.

The stimulatory effect of the rice polish could be obviated by filtration or ether extraction.

Growth stimulants in the *Lactobacillus arabinosus* biotin assay, V. R. WILLIAMS. (La. Expt. Sta.). (*Jour. Biol. Chem.*, 159 (1945), No. 1, pp. 237–238).—A brief note is presented to show that the same factors in rice polish which affect the *L. casei* assay for biotin (see above) also act as growth stimulants for *L. arabinosus*.

The microbiological determination of nicotinic acid, nicotinamide, and nicotinic acid, B. C. JOHNSON. (Univ. Ill.). (*Jour. Biol. Chem.*, 159 (1945), No. 1, pp. 227–230, illus. 1).—The medium of Gaines and Stahly (E. S. R., 90, p. 457) using *Leuconostoc mesenteroides* has been modified by the addition of purines, buffer, and glucose to give a maximum titration value of 12 to 15 cc. 0.1 N NaOH. *L. mesenteroides* has been considered to react specifically to nicotinic acid, as no response to nicotinamide or nicotinic acid was noted in doses up to 10 $\mu\text{g./tube}$. By using this organism as a test, parallel with the *Lactobacillus arabinosus* assay procedure of Krehl et al. (E. S. R., 90, p. 727), a differential determination of nicotinic acid and its derivatives could be made. Nicotinamide could be hydrolyzed to nicotinic acid by treatment with

0.6 N H_2SO_4 for 1 hr. at 15-lb. pressure. Under these condition, nicotinuric acid remained unchanged.

The excretion of nicotinic acid, nicotinamide, nicotinuric acid, and N^1 -methylnicotinamide by normal individuals, B. C. JOHNSON, T. S. HAMILTON, and H. H. MITCHELL. (Univ. Ill.). (*Jour. Biol. Chem.*, 159 (1945), No. 1, pp. 231-236).—A study of the metabolism of nicotinic acid and its metabolites was carried out by the procedures outlined above. N^1 -methylnicotinamide was assayed by the fluorometric method of Huff and Perlzweig (*E. S. R.*, 92, p. 6). Four men subjected to a hot moist environment were fed a normal diet to which 50 mg. of nicotinamide were added at intervals over a 5-day period. Analyses were made for nicotinic acid, nicotinamide, nicotinuric acid, and N^1 -methylnicotinamide excreted in the urine and sweat.

Results showed that over 94 percent of the nicotinic acid and metabolites excreted in the urine was in the form of N^1 -methylnicotinamide, only 1-1.5 percent being excreted as free nicotinic acid, and 3.5-4.5 percent as nicotinamide. "No nicotinuric acid was found in either urine or sweat." The amounts of all these metabolites excreted in sweat were considered to be too small to be of significance in the nicotinuric acid requirement of man.

Fecal riboflavin of rats receiving varying intakes of riboflavin, H. G. OBERMEYER, E. WURTZ, and G. A. EMERSON (*Soc. Expt. Biol. and Med. Proc.*, 59 (1945), No. 2, pp. 300-302).—A riboflavin-free purified diet was fed to weanling male rats, with daily supplements of 10 μg . or 40 μg . riboflavin fed by stomach tube to certain groups of animals. Those rats receiving the supplements were so subdivided that one group on each level of riboflavin was restricted to 50 percent of the caloric intake of the corresponding ad libitum group.

Fecal riboflavin was determined by the fluorometric method. Results showed that the concentration of riboflavin (as expressed in micrograms per gram of feces) was essentially the same for all groups. It more nearly followed the food consumption and seemed independent of the riboflavin intake.

"The total output of riboflavin was dependent upon the quantity of feces excreted. Rats receiving riboflavin but with the caloric intakes restricted to the extent of 50 percent excreted less total riboflavin than did their ad libitum controls."

A note on sterol production by *Aspergillus flavus-oryzae* with special reference to its anti-rachitic potency, W. J. ELLIS (*Jour. Council Sci. and Indus. Res. [Austral.]*, 18 (1945), No. 4, pp. 314-317, illus. 1).—The total sterol content of wheat bran mash was doubled by growing on it a mold of this group. The spectral absorption curves of alcoholic extracts of the moldy bran resembled those for ergosterol, and the antirachitic potency for rats observed after drying the bran in the sun was equivalent to approximately 1,800 International Units Vitamin D per 100 gm. of the water-extracted dry moldy bran.

Non-availability of fecal thiamine in thiamine deficiency, G. A. EMERSON and H. G. OBERMEYER (*Soc. Expt. Biol. and Med. Proc.*, 59 (1945), No. 2, pp. 299-300).—Weanling male rats were fed a thiamine-low diet—technical casein, 16; cornstarch, 60; autoclaved brewers' yeast, 9; salt mix, 4; Crisco, 9; cod-liver oil, 2; and nonirradiated brewers' yeast, 0.2. The groups received either 0, 5 μg ., or 50 μg . of thiamine daily. Fecal thiamine excretion was measured by the thiochrome method. Results showed that "rats maintained on a thiamine-deficient diet excreted essentially the same concentration of thiamine in their stools as did animals receiving 5 or 50 μg . of thiamine daily. The output of feces was greatly reduced in the thiamine low group. During the later stages of the depletion the thiamine was present largely in the form of cocarboxylase.

"The fecal thiamine of the deficient rats was not available when administered curatively by the oral route to animals which had plateaued in weight on a thiamine-low diet."

Biological estimation of the thiazole and pyrimidine moieties of vitamin B₁. H. G. OBERMEYER and L. CHEN (*Jour. Biol. Chem.*, 159 (1945), No. 1, pp. 117-122).—A differential procedure is described based upon the ability of bakers' yeast to synthesize thiamine from the active thiazole and pyrimidine moieties. In thiamine degradation products, these moieties can be estimated individually without interference from other fermentation-stimulating substances. Several derivatives of thiazole and pyrimidine were tested and their activity determined. Results indicate that a substantial amount of available thiazole and pyrimidine may remain in food products in which thiamine has undergone partial decomposition. The authors discuss these findings and their bearing upon the intestinal synthesis of thiamine in feeding experiments.

Stability of thiamin chloride (vitamin B₁) in mineral and vitamin-fortified cereal, A. B. EKLUND and V. R. GODDARD. (Univ. Calif.). (*Food Res.* 10 (1945), No. 5, pp. 365-372).—Eleven breakfast cereals showed a range of values from pH 5.1 to 7.5 in the raw state and from pH 5.5 to 7.3 when cooked. The cereal which tested to give the highest pH value was a product fortified with thiamine chloride and minerals. This cereal was assayed for thiamine by the biological (rat-growth) method of Booher and Hartzler (*E. S. R.*, 83, p. 131) both before and after quick cooking to determine the effect of the cooking process upon thiamine stability.

The thiamine value was found to be 3.2 for the raw cereal and 4.2 μ g. per gram for the cooked.

The authors conclude that quick cooking of this cereal caused no destruction of the added thiamine and possibly increased its availability to a slight extent.

Further studies on factors that affect xanthurenic acid excretion, E. C. MILLER and C. A. BAUMANN. (Wis. Expt. Sta.). (*Jour. Biol. Chem.*, 159 (1945), No. 1, pp. 173-183).—Xanthurenic acid metabolism was studied by the procedures previously reported (*E. S. R.*, 95, p. 128). Data are presented on the excretion of administered xanthurenic acid by normal and pyridoxine-deficient mice and rats. Studies were also made on the relative effectiveness of pyridoxal and pyridoxamine in promoting growth and preventing excretion of xanthurenic acid.

Mice fed 0.5 or 3.0 mg. of xanthurenic acid per gram of diet excreted about 16 percent in the urine. Rats fed single doses (12 to 20 mg.) excreted 10 to 30 percent in the urine in 3 to 7 days, while those injected intraperitoneally excreted 50 to 58 percent within 24 hr. The percentage of the doses that could be recovered was essentially the same whether pyridoxine was administered or not.

Pyridoxine-deficient rats excreted 12 to 16 percent of an intraperitoneal injection of 1-tryptophan, as xanthurenic acid in the urine, while only 1 percent was excreted by rats receiving pyridoxine in the diet.

Mice and rats fed xanthurenic acid in the diet excreted from 5 to 25 percent of the compound in the feces. No increased fecal excretion was observed after feeding diets high in casein to pyridoxine-deficient or control rats and mice, or after feeding single doses of tryptophan to pyridoxine-deficient rats.

The consumption of 3 mg. of xanthurenic acid per gram of diet for 31 days had no effect on the growth or survival of control or pyridoxine-deficient mice. These mice excreted as much xanthurenic acid in the urine as did deficient mice on 45 percent casein diets.

As judged by both growth and excretion of xanthurenic acid, pyridoxamine

and pyridoxal were less active for mice than pyridoxine. By growth tests these compounds also appeared to be less active for rats. A sample of the lactone of 2-methyl-3-hydroxy-4-hydroxymethyl-5-carboxypyridine was found to have only slight activity for mice.

Retention of ascorbic acid in marmalade during preparation and storage, R. LINCOLN and C. M. MCCAY. (Cornell Univ.). (*Food Res.*, 10 (1945), No. 4, pp. 357-363, illus. 1).—The preparation of a marmalade high in ascorbic acid was achieved by the use of orange and lemon peel or orange and grapefruit peel. The use of 1.2 parts fruit to 1 part sugar was satisfactory. The proportion of peel to fruit was 0.2 to 1.0. Commercial marmalades (stored for an indefinite period) gave ascorbic acid values ranging from 4 to 10 mg./100 gm., while the experimental samples (with orange and lemon peel) contained 28.6 mg./100 gm. This corresponded to a retention of 68 percent of the amount present before preparation. A marmalade containing 40 mg. percent ascorbic acid was prepared by using grapefruit and orange peel.

Ascorbic acid values for orange and lemon peel were found to average 115 and 178 mg. percent, respectively.

When marmalades prepared with or without the addition of citric acid were stored at 38°, 86°, and 100° F., the ascorbic acid losses increased with increase in storage temperature. However, over a 16-week period, samples prepared with citric acid showed very little loss of ascorbic acid (approximately 15 percent even at 100°). Practically no loss occurred at 38°.

Assays for ascorbic acid made by several methods—indophenol, phenylhydrazine, and the formaldehyde method of Mapson (*E. S. R.*, 93, p. 538)—indicated that in the marmalade samples stored at high temperatures (86° to 100°), a large percentage of the ascorbic acid values obtained by the first two methods were due to other reducing substances. When the ascorbic acid content was high, the nonspecific reducing substances were small (approximately 5 percent).

Vitamin C changes occurring in tomatoes during home canning and subsequent storage, M. B. PATTON (*Ohio Sta. Bimo. Bul.* 239 (1946), pp. 44-46, illus. 1).—Experimentally grown tomatoes of the Marosu variety were tested over a 3-yr. period. Ascorbic acid determinations were made on various samples—raw freshly harvested, after removal of skin and core, and after canning. No loss of ascorbic acid was observed when the tomatoes were allowed to stand 2 days before canning.

The ascorbic acid content of the freshly harvested tomatoes averaged 20.2, 25.2, and 26.0 mg./100 gm. wet weight for the 3 yr., respectively. Removal of core and skin resulted in an approximately 15 percent loss of ascorbic acid. The yearly averages of ascorbic acid retention in tomatoes analyzed within 24 hr. after canning by the hot pack method were 85, 88, and 76 percent, respectively.

Assays were made at intervals over a 12- to 16-mo. period in which the canned tomatoes were stored at room temperature. Results showed a progressive loss of ascorbic acid; the greatest rate of loss taking place during the first 3 mo. of storage. After 12 months' storage, the ascorbic acid content averaged slightly more than 50 percent of the amount originally present in the canned tomatoes.

Inhibition of pigment deposition in incisor teeth of rats deficient in vitamin E from birth, H. GRANADOS and H. DAM (*Soc. Expt. Biol. and Med. Proc.*, 59 (1945), No. 2, pp. 295-296, illus. 1).—Normal female rats and their offspring were maintained for 60 days on the high- and low-fat vitamin E-deficient rations previously described (*E. S. R.*, 94, p. 279). An additional diet con-

sisting of vitamin E-deficient rations but containing 20 percent of lard was also tested. Production of normal pigment did not occur in the enamel of the incisor teeth of the young of those rats fed vitamin E-deficient high-fat rations (20 percent of cod liver oil or 20 percent of lard).

TEXTILES AND CLOTHING

Selected references relating to the field of color science, D. NICKERSON. (U. S. D. A.). (*Textile Res. Jour.*, 16 (1946), No. 2, pp. 74-83).—This specialized bibliography lists books which are currently important to a technical worker in the science of color and its application. The list is prepared under these headings: General references; color standards and color charts; color tests; the eye; and periodical literature.

New test apparatus for measuring the coolness of textiles, R. H. ARMITAGE (*Rayon Textile Mo.*, 26 (1945), No. 11, pp. 77-78).—The apparatus described here measures the combined effect of air and moisture permeability, absorption, and evaporation of the fabrics. Operation and fabric testing procedures are outlined.

Physical properties of knitted fabrics made of natural and mercerized carded and combed cotton yarns, H. M. FLETCHER. (U. S. D. A.). (*Rayon Textile Mo.*, 26 (1945), No. 5, pp. 87-90, illus. 1).—"In the comparisons of carded and combed products the chief differences were found in the strength. In all cases the breaking strength of the combed yarns and the bursting strength of the fabrics knitted from these yarns were greater than the carded. The two groups showed no marked differences in other physical properties.

"In the comparisons of the natural and mercerized, the mercerized yarns were equal or greater in strength than the natural, but the mercerized yarns and also the fabrics had less elongation than the natural. The bursting strength of the fabrics knit of mercerized yarns was less in every case than those of natural yarns even though the mercerized yarns were equal or greater in breaking strength. The air permeability of the mercerized fabrics was greater than the natural. The two groups were similar in other characteristics."

A summary of the results of individual comparisons of the data on the various properties are tabulated.

Wool and its upkeep, L. LUND (*South Dakota Sta. Cir.* 63 (1946), pp. 4).—Wool properties which play an important part in its behavior are resilience, elasticity, and plasticity. Essential equipment for pressing wool materials efficiently include a well-padded board, heavy napped woolen pressing cloth, cotton cloths (cheesecloth or muslin, and heavy duck), sponge, padded roll for pressing seams, a tailor's cushion, and an ordinary or steam iron. Procedures for pressing wool and removing shine and baggy spots are given, and suggestions for care and storage are noted.

Mechanics of abrasion of textile materials, W. J. HAMBURGER (*Textile Res. Jour.*, 15 (1945), No. 5, pp. 169-177, illus. 6).—"A method is described for predicting the inherent abrasion resistance of textile materials substantively by the use of load-elongation diagrams of mechanically conditioned specimens. Immediate and delayed deflections are discussed as they affect energy coefficient E. This coefficient is shown to be a function of: (1) Low modulus of elasticity; (2) large immediate elastic deflection; (3) high ratio of primary to secondary creep; (4) high magnitude of primary creep; and (5) high rate of primary creep.

"Nylon shrunk, nylon unshrunk, acetate, and viscose yarns are evaluated

on the Taber Abraser, and from rate-of-destruction curves durability coefficients D are obtained. Correlation is shown to exist between durability coefficients and energy coefficients and energy coefficients for the four yarns."

A study of lining fabric abrasion, W. J. HAMBURGER and H. N. LEE (*Rayon Textile Mo.*, 26 (1945), Nos. 7, pp. 93-96, illus. 6; 8, pp. 61-64, illus. 14).—The problem of properly evaluating the abrasion resistance of viscose and Celanese lining fabrics was considered from the cause and effect point of view. The Taber Abraser was selected as the laboratory means of creating destruction by abrasion action, and a procedure standard was established. The effect of such abrasion was studied by examining microscopically the yarns and the fabric. From the data obtained on the physical properties governing repeated stress performance of textile materials, Celanese manifests a greater resistance to abrasion than does viscose for the materials investigated.

Wear resistance of apparel textiles: A literature survey, H. S. HALL and E. R. KASWELL (*Textile Res. Jour.*, 15 (1945), No. 5, pp. 178-189, illus. 2).—The scope of this survey covers abstracts and articles in periodicals which deal with textiles and related fields. The material included is confined to the subject of wear, with emphasis placed upon wear by abrasion. Also included are short descriptions of test machines and apparatus, methods, techniques, observations, and evaluations for measuring certain wear factors.

Report of committee on flammability of consumer textiles, H. E. HAGER (*Amer. Dyestuff Rptr.*, 34 (1945), No. 15, pp. P291-P292, illus. 1).—This paper reports a test method which distinguishes between dangerous fabrics and nondangerous fabrics and evaluates them for flammability characteristics by measuring their rate of burning. A description of the test apparatus and directions for its use in determining the flammability of test specimens are outlined. Using this test procedure, correlated test reports will serve as a basis for drawing up a tentative method which may be accepted as a commercial standard and serve as a basis for a Federal law.

Inflammability of consumer textiles, F. BONNET (*Rayon Textile Mo.*, 26 (1945), No. 7, pp. 62-64, illus. 1).—Legislation regarding the inflammability of garment fabrics is reviewed in this report. An account is given of the proposed tentative test method for evaluating textile materials and test apparatus noted above.

Evaluation of fabrics as to their flammability (*Amer. Dyestuff Rptr.*, 35 (1946), No. 1, pp. P20-P25, illus. 4).—In consideration of the above reports, this paper deals with difficulties encountered in arriving at a test method for evaluating textile flammability. As a result of correlated test reports from various laboratories, minor changes were suggested. These include conditioning the test specimens as a means of controlling burning time averages of the fabrics, and controlling the relative humidity of the fabric as well as drying temperatures. Revised instructions for operating the flammability tester and proposed testing procedures are given.

Durable flameproofing suitable for cotton outer garments, K. S. CAMPBELL and J. E. SANDS. (U. S. D. A.). (*Textile World*, 96 (1946), No. 4, pp. 118-119, 222, 226, illus. 1).—A flameproofing agent made with a resin of proper chlorine content was produced by employing an emulsion technic and by incorporating a water-soluble formaldehyde resin monomer. Mechanical application of the finish required passage through a two- or three-roll padder. Tests demonstrating the relative efficiency of the treatment showed that the proofed material increased in weight 30-60 percent, depending upon the type of fabric used. Fabrics so treated were found suitable for work uniforms, life-jacket vests, or coveralls. After 24 individual washings with soap and soda

ash at 160° to 170° F. in a commercial-type laundry machine, the fabric did not ignite with a lighted match.

Evaluation of fabric pest deterrents (*Amer. Dyestuff Rptr.*, 34 (1945), No. 21, pp. P400-P403, illus. 2).—This tentative method of test covers the biological procedure for determining the insect resistance of fabrics which contain wool or other susceptible fibers. The insect pests discussed here apply to webbing clothes moths and black carpet beetles larvae. The excrement weight method and the fabric loss method, previously noted (E. S. R., 92, p. 601), are discussed from the standpoints of test conditions, test insects (specific insects in each test given), and extent of damage. Visual examinations, based on visualometer readings, are described. The life cycle method is being considered as a final criterion on the efficiency of a moth-proofing compound. Tentative procedures for rearing and handling cultures of the black carpet beetle and webbing clothes moth for experimental purposes are noted.

Evaluation of compounds designed to increase the resistance of fabrics and yarns to insect pests (*Amer. Dyestuff Rptr.*, 34 (1945), No. 21, pp. P403-P404).—The procedure for the evaluation of compounds or treatments designed to protect textiles from damage by insect pests (moths and carpet beetles) is covered in this tentative method outlined here. It considers not only the initial protection furnished by the treatment in question, but also the permanency of this protection during ordinary conditions of use. The following conditions of use are noted: Duration, washing, cleaning, hot pressing, light, abrasion, sea water, and perspiration. The resistance of the treated fabric to insect pests is determined by the tentative method outlined above.

Effects of mildew on vegetable tanned strap leather, J. R. KANAGY, A. M. CHARLES, E. ABRAMS, and R. F. TENER (*Jour. Amer. Leather Chem. Assoc.*, 41 (1946), No. 5, pp. 198-213, illus. 7).—The action of mildew on vegetable-tanned leather produces changes in its physical properties. These changes were found due at least in part to removal of the grease, causing an increase in stiffness and a loss in both tensile strength and stretch at the breaking point; the grain was also weakened. Mildew caused no appreciable deterioration of hide substance in the leather.

Hosiery size and fitting standards utilize new device, W. P. SEEM (*Textile World*, 96 (1946), No. 3, pp. 125, 127, 240, illus. 3).—Newly developed hosiery fitting measure devices, providing a key to comprehensive size classification system, are now being perfected. These are designed to put hosiery knitting specifications and nylon preboarding on a wearing instead of a boarding length basis and to afford accurate testing for stretch and recoverability. It is estimated that 95 percent of women's leg sizes can be gaged by these devices, where at present 95 percent of the hosiery manufacturers produce only one length and one width size.

Sewing for the home, M. B. PICKEN (*New York and London: Harper & Bros.*, 1946, rev. and enl., pp. 211+, about 200 illus.).—This book deals in detail with the making of fabric furnishings for the home. Construction principles set forth here are illustrated by color pictures and by diagrammatical drawings.

HOME MANAGEMENT AND EQUIPMENT

Planning your house of the future, H. GOLDSTEIN (*Minn. Farm and Home Sci. [Minnesota Station]*, 3 (1946), No. 2, pp. 8-9, illus. 4).—This is a discussion of methods for planning to build or remodel a house and install equipment.

REPORTS AND PROCEEDINGS

Fifty-eighth Annual Report, Colorado Agricultural Experiment Station, 1944-45, H. J. HENNEY. (Partly coop. U. S. D. A.). (*Colorado Sta. Rpt. 1945, pp. 52, illus. 4*).—Results are briefly noted of progress in the division of agriculture, including tests of hybrid corn, a new barley, longevity of farm seeds, value of trashy fallow, and benefits from nitrogen fertilizers; animal investigations, including winter and summer feeding tests with cattle, ammoniated dried beet pulp and urea as protein sources, preservatives for alfalfa storage, nutrient utilization by steers of different body types, utilization of potatoes, alfalfa, and sweet clover as silage, beet pulp for fattening lambs, and pinto beans and potatoes for fattening pigs; plant pathology, including a new type of net necrosis, and control of pea diseases, *Verticillium albo-atrum* in sugar beets, and virus diseases of peaches; chemistry, including the relative absence of selenium and molybdenum under irrigation; entomology, including notes on the russet mite of tomatoes, control of the bean cutworm, Mexican bean beetle, codling moth, potato insects, aphid yellows of celery, and *Myzus persicae* Sulzer as a vector of peach mosaic; home economics, including vitamin losses in processing vegetables; horticulture, including effect of minor elements on potatoes, potato breeding, potato virus diseases, bacterial wilt, and ring rot, types of fertilizer and rate of application of sulfur for the San Luis Valley, breeding onions and peaches, fertilizers for peas, control of tomato fruit rot, and tests of tomato varieties and rust-resistant pinto beans; poultry, including notes on soybean products, laying houses for Colorado, and factors affecting the quality of eggs; range and pasture management, including revegetation studies of depleted range and crop lands, nutritive value of native forage plants, and improvement of sagebrush lands and other range practices to increase livestock production; rural economics, including notes on a two-edged potato seed cutter and marketing Colorado peaches; veterinary pathology, including notes on abscessed liver in cattle, overeating in feed-lot lambs and feed-lot gains as affected by drenching, rearing and diseases of foxes, nymphomania in cattle, and bovine mastitis; and engineering, including notes on the application of irrigation, notes on sugar beet machinery, and mechanical handling of cull potatoes.

Fifty-seventh Annual Report [of Georgia Station], 1945, H. P. STUCKEY. (Partly coop. U. S. D. A. et al.). (*Georgia Sta. Rpt. 1945, pp. 91, illus. 4*).—This report presents research findings in agricultural economics, including data on the wartime production capacity of Georgia farms in 1945, postwar adjustments in agricultural production, farm tenancy, Georgia farm prices, and a farm management analysis of dairying in Putnam County; agronomy, including yield tests with Empire and other cotton varieties, breeding cotton for wilt resistance, cotton defoliation and seed treatments, varieties of soybeans, sericea lespedeza, and kudzu, breeding corn, wheat, oats, barley, and rye, fertilizers for rye, oats, wheat, and barley, effect of fertilizers on *Sclerotium rolfsii* on Spanish peanuts, potash and borax for alfalfa, lime for cotton, silicate slag v. calcic limestone for corn and pimientos, liquid ammonia for sorghum, and sulfate of ammonia for corn; animal industry, including studies of home-grown roughages and sweetpotato meal for dairy cattle, supplementary concentrate feeding of dairy heifers and young beef cattle, wintering cattle on peanut hay and other feeds, comparison of cracked barley, wheat, and corn, and whole wheat for fattening beef cattle, creep feeding beef calves on pasture, sheep breeding, worm control in sheep, green grazing v. kudzu and pea-vine hay for swine, and control of the sheep tick and sheep

louse; pasture investigations, with beef cows and suckling calves, fertilizers and supplementary water, nitrogen sources for Bermuda grass, seeding winter grains for grazing, and alfalfa varieties; botany, including diseases of muscadine grapes, root rot of snap beans, peanut breeding, seed treatment, spacing, and leafspot control, breeding melons for wilt resistance, cantaloups for mildew resistance, tomatoes for disease resistance, and studies of diseases of field peas, vetch, soybeans, and lespedeza; chemistry, including studies of peanut byproducts for swine, sorghum sirup, peanut butter, and water-soluble N and moisture in peanuts; entomology, including studies of the cowpea curculio, stored peanut insects, the lesser cornstalk borer, lespedeza webworm, false chinch bug, and true chinch bug; food processing, including blanching of blueberries, apples, raspberries, blackberries, and various vegetables, and control of moisture in peanuts and peanut products; home economics, including studies of butter beans, sweetpotatoes, pimientos, turnip greens, asparagus, and snap beans; horticulture, including N fertilization of peach trees, peach varieties, breeding and culture of muscadine grapes, fertilizers for trees grown for posts, pimiento spacing, and sweetpotato breeding; results at the Mountain Experiment Station with grapes, vegetable varieties, irrigation, wheat, barley, corn, soybeans, and clover, and urea-treated bagasse v. bagasse and green soybeans for beef cattle.

Annual Report of the Massachusetts Agricultural Experiment Station, 1945, [F. J. SIEVERS]. (Partly coop. U. S. D. A. et al.). (*Massachusetts Sta. Bul.* 428 (1945), pp. 71, illus. 2).—In addition to data noted elsewhere in this issue, this report gives results of progress in investigations in agricultural economics, including an analysis of milk trucking operations, farm real estate taxation, and land clearing and improvement; agronomy, including studies of brown and black root rots of tobacco, disinfection of tobacco seedlings, absorption by food plants of elements important in human nutrition, intake of elements applied in pairs v. singly, magnesium requirements of plants, long-time fertility tests, sunflowers and their possibilities, soil conservation with special reference to soil erosion, potato seed treatments and varieties, onion breeding, tests of hay and pasture seeding mixtures and oat varieties, *Bromus arvensis* for poultry ranges, and breeding of orchard grass; animal husbandry, including studies of legume and grass silage and the effect of feeding synthetic thyroprotein to milking cows; bacteriology, including studies of rural water supplies, milk supplies, and septic tank efficiency; botany, including work on the Dutch elm disease, hurricane and other damage of shade trees, damping-off and growth of seedlings and cuttings, control of diseases of plants caused by soil-infesting organisms, *Cladosporium fulvum* as the cause of tomato leaf mold and its control, control of squash decay in storage, interrelation of wettable sulfur, lead arsenate, and lime in apple spraying, effect of soil temperature on leaf shape of tobacco, toxic effect of creosote and other wood preservatives on plants, chlorine injury to plants, and resistance in carnations to *Fusarium dianthi*; chemistry, including notes on the ratio of various vitamins in late summer milk, effect of sunshine on ascorbic acid and riboflavin content of milk, vitamin content and other constituents of goat's milk, and influence of calcium and magnesium on lettuce; cranberry work, including notes on the hill fireworm (*Cirphis unipuncta*), Sabadilla and DDT as insecticides, winterkilling, and frost injury; dairy industry, including sterilizing agents, flavor improvement in milk and milk products, and packaged ice cream; economics, including farm adjustments; engineering, including poultry house construction and equipment; entomology, including studies of insecticidal materials for the European corn borer and other pests, potato spraying

for insects and diseases, control of onion thrips, the celery plant bug, red spider, plum curculio, cabbage mite, squash-vine borer, scolytids in elm log piles, and apple maggot emergence; floriculture, including the breeding of snapdragons and carnations, culture of *Anemone coronaria*, and effect of fungicidal hormones on carnation and geranium cuttings; food technology, including the nutritive value of mushrooms, glass container research, home freezing of fruit and vegetable varieties, utilization of the female sculpin, venting community cannery-type retorts, and fortifying red squill and vitamin D milk; home economics nutrition, including studies of the relationship between calcification of eggshell and carbonic anhydrase, and the requirement for calcium by children during growth; horticulture, including factors influencing the hardiness of evergreens and the transplanting of evergreens, olericulture, including weed control for carrots and parsnips, the carotene content of carrots, breeding of sweet corn, peppers, tomatoes, cucumbers, rutabagas, lettuce, and butternut squash and the culture of asparagus; pomology, including the influence of various clonal rootstocks on apple varieties, bud sports of the McIntosh apple, tree characters of apples and peaches, winter hardiness in the raspberry, controlled-atmosphere storage of apples, cultivation v. sod for the bearing orchard, varieties of apples and peaches, blueberry culture, preharvest dropping of apples, magnesium deficiency in Massachusetts apple orchards, thinning apples with caustic sprays, and ammonium sulfamate for poison ivy and weed grasses; poultry husbandry, including broodiness in poultry selective breeding to reduce mortality, inheritance of higher fecundity, fertility cycles in males, a genetic analysis of Rhode Island Red color, egg characters in the domestic fowl, methods of feeding the laying flock, and poultry housing; and veterinary science, including notes on hemangioma tumors in poultry, protozoa in turkeys, flock mortality, and control of infectious bronchitis.

Fifty-second Annual Report [of Minnesota Station], 1945, C. H. BAILEY (*Minnesota Sta. Rpt. 1945, pp. 28*).—Among other administrative data, this report lists the station publications and other contributions of the year.

The [Missouri] Agricultural Experiment Station serves the farmer: Work of 2 years ending June 30, 1943, M. F. MILLER, S. B. SHIRKY, and H. J. L'HOTE. (Partly coop. U. S. D. A.). (*Missouri Sta. Bul. 490 (1945), pp. 132, illus. 26*).—Results are briefly noted of projects in agricultural chemistry, including notes on abnormal bleeding in swine, vitamins required by small animals, and chick nutrition on synthetic rations; agricultural economics, including land use studies, productive value of Missouri pastures, feed imports required in 1943, turkey production in Missouri, conservation of transportation facilities for farm products, land tenure in Missouri, farm land as an investment and the farm real estate situation, land values and rents in Atchison County, farming systems for small farms, influence of declining land productivity on land values, cooperative organizations in Missouri, farm construction needs, cost of producing cotting in southeast Missouri, and wartime utilization of farm labor and equipment; agricultural engineering, including use of a curved rafter type of construction in a machine shed, effect of ventilation on egg production, tillage methods for corn, cost of service for small tractors, hay harvesting costs, home-made electrical equipment, irrigation of corn in river bottoms, and use of straw in soil building; animal husbandry, including notes on the managed grazing of bluegrass, vitamin needs of swine, breeding systems for swine improvement, forage crops for swine, supplements to corn for fattening hogs, lespedeza seed as a protein supplement for lambs and fattening cattle, use of roughage in beef production, wintering yearling steers

on silage, physiology of reproduction in hogs, cattle, and sheep, black fibers, dwarfism, and turned-in-eyelids in sheep, and bleeder and other abnormalities in swine; botany, including studies of tomato resistance to *Fusarium* wilt and notes on other diseases; dairy husbandry, including studies of thyroprotein, the texture and structure of ice cream, sources of *Oospora lactis* on dairy farms, mold mycelia in ice cream and butter, artificial insemination of dairy cows, mechanization of milk secretion and mammary gland growth, the parathyroid gland and calcium metabolism, production of veal calves, rate of growth of dairy heifers, feeding value of lespedeza seed and hay, methods for lactose determination, heat-resistant bacteria in milk, lactose-fermenting yeasts in cream, metabolism in growth, construction of a straw loft calf barn, pasture studies, and tests of limited grain v. full grain rations, wave diathermy for mastitis, and value of condensed whey solids for butterfat production; entomology, including studies of ticks, chinch bug and codling moth control, insecticides, and control of the strawberry leaf roller and cucumber beetles; field crops, including breeding wheat, barley, and oats, improvement of pastures and soybeans, efficiency of grain-legume short rotations, cotton varieties, open-pollinated v. hybrid corn, control of seed corn diseases, comparison of X-ray and ultraviolet mutations, anthocyanin pigments in corn, and polyploidy in wheat and its relatives; home economics, including studies of the use of consumption credit by farm families, relation of the carotene and xanthophyll contents of the diet to the growth of young chicks, vitamin potency of pork as influenced by the rations, tests of flours for adaptiveness, and prices and qualities of towels and toweling; horticulture, including studies of biennial bearing of apples, effect of hormone sprays on tomatoes and peppers, nutrition of vegetables, adaptability of 64 kinds of flowers for outdoor planting, commercial production of various flowers, Christmas trees as a Missouri crop, inoculation of garden peas, soil management for young apple trees, value of stimulating substances for strawberry plants, soil fertility maintenance for tomatoes in glazed containers, value of heavy nitrogen applications for apple trees in sod, correctives for arsenical injury of apple foliage, and black rot control on grapes; poultry husbandry, including cleaning soiled shell eggs and stabilizing quality, effect of time of hatching White Leghorn chicks on egg production, normal growth rates for chickens, nutritional requirements of turkeys, protein supplements in poultry rations, feed purchasing power of eggs, and comparative values of various grains for egg production; rural sociology, including rural health facilities in Missouri and handicraft production in the Ozark region; soils, including studies of cationic activities, uptake of nutrient elements by plants, fine lime for legumes, relation of soil composition to nitrogen fixation and plant composition, function of the colloidal fraction of the soil, moisture movements in soils, rejuvenating eroded soils, use of cornstalks and straw in soil building, fertilizer tests with various crops and permanent pastures, function of acid clays in plant nutrition, and nitrogen and carbon accumulation in the soil; and veterinary science, including studies of blackhead in turkeys, leukosis and neuritis of fowls, worms in sheep, reactions to the Bang agglutination test in cattle and blood studies in Bang's disease, toxemia in sheep, and trichomoniasis in turkeys.

Investigations for the benefit of the Missouri farmer: Work of the [Missouri] Agricultural Experiment Station during the year ending June 30, 1944, M. F. MILLER, S. B. SHIRKY, H. J. L'HOTE, ET AL. (Coop. U. S. D. A. et al.). (*Missouri Sta. Bul.* 491 (1945), pp. 71, illus. 18).—In addition to reports on projects noted elsewhere in this issue or previously, progress results are pre-

sented in agricultural chemistry, including data on unrecognized vitamins required by livestock, vitamins and minerals required in lactation, nutritional requirements of poultry, and abnormal bleeding in swine; agricultural economics, including maximum wartime production possibilities in Missouri, trucking of livestock to Kansas City, variations in production per farm and per worker, and production adjustments tending to lower costs; agricultural engineering, including tests of a fertilizer drill for pastures and a contour furrowing plow with fertilizer attachment, a baffle to prevent drafts in open-front poultry houses, a portable farm elevator, utilizing straw in soil building, a metering device for compounding mixed feeds, and hay harvesting machinery; entomology, including control of ticks, chinch bugs, and codling moth, tests of DDT and other insecticides, and control of insect pests of melons and other cucurbits; animal husbandry, including pasture fertilization and winter feeds to increase gains of steers, swine breeding, inheritance in sheep, factors involved in muscular work in horses and mules, and semen investigations in boars, rams, and cocks; botany, including the development of wilt-resistant tomatoes, and control of seedling diseases of cereals; dairy husbandry, including studies of milk secretion, *Oospora lactis* in milk, cream, and butter, milking machine sanitation, mastitis treatment, artificial insemination of dairy cows, feeding tests with lowered grain rations for dairy cows and use of condensed whey and soybean meal for calves, composition of cheese and whey, energy efficiency of growth and work, and nutritional studies on growth and milk production, including work with Korean lespedeza, rye for silage, and use of thyroprotein during declining lactation; field crops, including development of corn hybrids, genetic studies with wheat and corn, improved oat, barley, wheat, cotton, and soybean varieties, and pasture improvement and management; home economics, including tests of soybean varieties and soya flower, and cotton and synthetic fabrics; horticulture, including control of spray injury to apples, tests of Fermate on various fruits, nitrogen fertilization of apple trees, regulating fruit set of apples with caustic sprays, subirrigation nutrient culture and hormone sprays for greenhouse crops, control of aster wilt, and relation of soil fertility to the vitamin and mineral content of vegetables; poultry husbandry, including reduction of egg spoilage in storage by thermostabilization, vegetable protein concentrates for egg production, soybean oil meal for young chicks, relative feed-purchasing power of eggs 1937-43, closed flock breeding, and protein needs of turkeys; soils, including erosion studies, nitrogen and carbon accumulation in soils, formation of clay soils from primary igneous rocks, properties of nontronite, attapulgite, and saponite, and the origin of heavy clay subsoils; and veterinary science, including control of internal parasites in sheep, studies of Bang's disease, the agglutination test, and vaccination, fowl paralysis, and pregnancy diseases of sheep.

Fifty-sixth Annual Report [of New Mexico Station, 1945], A. S. CUREY. (Partly coop. U. S. D. A.). (*New Mexico Sta. Rpt. 1945, pp. 58+, illus. 14*).—This report gives data from the departments of animal husbandry, including studies of the revegetation and carrying capacity of southwestern ranges, levels of nutrition for ewes, weights of range sheep, rations for fattening lambs, comparative physical characteristics of sheep and their offspring, relation of the carotene content of range forage to the vitamin A requirements of breeding cows, seasonal phosphorus supplements for range cattle, and low-protein roughage for range cattle; dairy husbandry, including notes on the use of a vitamin A supplement with a calf starter without animal protein, irrigated pastures for dairy cattle, and Johne's disease in goats; poultry

husbandry, including tests of dried buttermilk for laying hens, effectiveness of ferrous sulfate in preventing egg-yolk discoloration produced by cottonseed meal, and the inheritance of firm egg albumin; irrigation studies with cotton; agronomy, including notes on cotton varieties and cotton breeding, grade and staple estimates, and the effect of alfalfa, variety and fertilizer tests with alfalfa, grasses and legumes for pastures, varieties of barley, sugar beets, and sorghums, varieties and hybrids of corn and pinto beans, and effect of the preceding crop and of the fertilizer treatments on sugar-beet seed; dry farming investigations, including variety trials of sorghums, pinto beans, corn, millet, barley, wheat, alfalfa, potatoes, lettuce, tomatoes, sweet corn, permanent pastures, and sugar beets; horticulture, including fertilizer tests with potatoes, seed production of White Grano onions, variety tests with pecans, biennial bearing of apples, DDT for codling moth, corn earworm, and western flower thrips, and control of pink root of onions; home economics, including the carotene and ascorbic acid content of peppers and carrots and the ascorbic acid content of cantaloups; chemistry, including the content of NDGA (nordihydroguaiaretic acid) in creosote bush (*Larrea divaricata*); and agricultural economics, including the effect of wartime adjustments on the cost of cotton production, the economics of broomcorn production, and an analysis of sheep ranch organization.

Informe de la Estación Experimental Federal en Puerto Rico, 1944 [Report of the Puerto Rico Federal Station, 1944], [K. A. BARTLETT ET AL.]. (*Puerto Rico Fed. Sta. Rpt. 1944, Span. ed., pp. 55+*).—The English edition has been noted (E. S. R., 93, p. 668).

What's new in farm science; Annual report of the director [Wisconsin Station, 1944], I, compiled by N. CLARK and N. HOVELAND (*Wisconsin Sta. Bul. 468 (1945), pp. 72+, illus. 12*).—In addition to several items noted elsewhere in this issue, results are reported under soil conservation on the profitability of grassland farming, increase in wartime production by soil-conserving farms, costs of building terraces, and variation in farm incomes; farm business and rural welfare, showing a low school attendance of Wisconsin farm youth, farm earnings and debt reduction, relation of farm output to work capacity of family, dependency of profits in peas on yields, and need of planning for the rural-urban fringe around Madison; dairy products, including notes on types of cheese packages, gas in packaged cheese, seasonal variation in vitamin A content of cheese, and use of butter oil in vitamin D concentrate; farm animals, including notes on swine breeding, control of swine enteritis, trichomoniasis vaccination, and vitamin content of newborn lambs; feeding the family, including the value of skim-milk powder in cookery, buttermilk in biscuits, milk as a source of riboflavin, deflated soy flour in doughnuts, vitamins in fresh v. canned vegetables, quality of proteins in dehydrated meat, B-vitamin content of canned foods, and amino acid and folic acid content of meats; nutrition, including relation of corn to pellagra, relation of good nutrition and fluorine to dental health, butterfat as a preventive of vitamin B deficiency, high availability of iron in wheat bran, need of dogs for biotin, need of vitamin D to utilize phosphorus of cereals, importance of pyridoxine in protein metabolism, and development of abnormal blood vessels in swine on faulty rations; genetic limitations in mink breeding; and nutritional requirements of trout.

Fifty-fifth Annual Report [of Washington Station], 1945, E. C. JOHNSON ET AL. (Partly coop. U. S. D. A. et al.). (*Washington Sta. Bul. 470 (1945), pp. 167*).—Brief notes are given on progress results obtained in agricultural engineering, including temperature requirements of chicks during brooding,

livestock water heating, evaporative equipment for poultry house cooling, ultraviolet irradiation of turkey breeding flocks, insect electrocution, barn hay drying, and the jeep as a farm tractor; agronomy, including variety and breeding studies with wheat, barley, oats, and flax, improvement of peas, forage and pasture grasses, alfalfa, and sweetclover, crop rotations, control of bindweed, maintenance of fertility and organic matter in soils, and crop composition as influenced by soil types and fertilizers; animal husbandry, including vitamin, protein, and mineral requirements of the pig, nutritive adequacy of roughages and pea meal for fattening steers, adequacy of forages in vitamin A for sheep reproduction, progeny testing of rams, factors involved in the anestrus season of ewes, semen characteristics in rams, and development of a bacon-type hog; chemistry, including deficiencies in vegetable protein concentrates in poultry, availability for chicks of cystine and methionine in soybean oil meal, action of proteolytic enzymes on soybean oil meal proteins, tests of stationary spray systems, spray oils and ovicidal effectiveness, and spray residue analyses; dairy husbandry, including cheese making for vacuum canning, factors affecting the quality of dry milk solids, rations for dairy cattle, rotational v. continuous grazing of pastures, and oat gum and sodium alginate for stabilizing ice cream; entomology, including studies of potato flea beetles, increasing the efficiency of sulfur and lime-sulfur sprays, cryolite for codling moth, salts of dinitrophenol and dinitrocresol to control mites, control of the cherry maggot, bee poisoning in the Yakima Valley, control of crop pests by parasites, and the pear psylla survey; agricultural economics, including a comparison of farming systems in the State; home economics, including freezing of precooked foods, rancidity and thiamine retention in pork, and nutritive value of field peas; horticulture, including studies of orchard cover crops, vegetable seed production, fruit maturity, potato breeding, winter injury of fruits, factors affecting fruit set, spray injury, orchard fertilizers and irrigation, cork spot of pear quacy of cull peas for swine, grass-legume mixtures and grain feeding for trees, fertilizers for asparagus, breeding truck crops, variety studies of strawberries, raspberries, and apples, ornamentals for eastern Washington, fertilizers for grapes and cherries, freezing of vegetables, chlorosis of grapes, eradication of bindweed in orchards, and breeding of cranberries, blueberries, raspberries, and strawberries; plant pathology, including the plant disease survey, virus diseases of potatoes and stone fruits, control of alfalfa failures, influence of crop sequence on rhizoctonia infection in potatoes, yellows and root rot of strawberries, root rot of raspberries, black root of beets, smuts of wheat and oats, stem and root rots of peas, and smuts and rusts of grasses; poultry husbandry, including calcium, phosphorus, and vitamin D in the chick ration, protein levels for egg production, silage v. pasture for turkeys, silage for laying hens, vitamin D for turkeys, nutritional factors and effect of inheritance on fertility and hatchability in turkeys, the B-complex vitamins for turkey poults, and the etiology of perosis; veterinary research, including mastitis in dairy herds and avian coccidiosis; and results at the branch stations, including at Lind variety tests with wheat, barley, and rye, weed control, organic matter maintenance, and tests of various grasses; at Prosser, variety tests with alfalfa, corn, wheat, and barley, fertilizers for alfalfa, corn, asparagus, lima beans, and cherries, variety tests of peas, sweet corn, lima beans, soybeans, strawberries, and grapes, irrigation methods, crop rotations, reclamation of alkali soil, soil erosion, and wireworm investigations; at Wenatchee studies of stationary spray systems, dormant sprays, DDT and

other sprays, sulfur and lime-sulfur sprays for orchard mites and scale, control of apple powdery mildew and codling moth, spray residues, toxicity of orchard soils, orchard cover crops, winter injury, pollination and fruit set, fertilizers, irrigation, weed control, cork spot of pears, fruit maturity, and effect of preharvest drop sprays on pears; at Long Beach, studies on cranberry dormant and summer sprays, weed control, fertilizers, and fungicides; at the soil conservation station on erodibility, cropping and tillage practices, and runoff measurements; at the nursery division, Soil Conservation Service, on observations of grasses, legumes, shrubs, and trees, alfalfa-grass and sweetclover-grass conservation mixtures, strain type comparisons, pasture trials, and culture and seed production of grasses and legumes; and at the U. S. Fruit and Vegetable Products Laboratory on the canning of peaches and the recovery of sugar from pear cannery waste.

From the Western Washington Station, division reports are made in agronomy and soils, including fertilizer placement with beets, sweet corn, peas, potatoes, swiss chard, and spinach, fertilizer rates and ratios with beets, sweet corn, peas, potatoes, spinach, beans, and broccoli, the role of minor elements in western Washington, comparative value of phosphate carriers, and green manure and cover crops; chemistry, including ground dehydrated flat pea forage for poultry, fluorine content of prune leaves, toxicity of flat peas forage and seed, management of poultry-house litter, and silage for poultry; entomology, including studies of the cherry fruit flies, bud and leaf nematode of Croft lilies, effect of chemical treatments on scale propagation, the seed corn maggot, the loganberry mite, and aphid resistance of red raspberry seedlings; grazing, including trials with cattle and sheep, the toxicity of the flat pea, and inoculants for flat peas; horticulture, including strawberry and raspberry breeding, peach varieties, root stimulants for evergreen cuttings, and variety tests of vegetables; plant pathology, including seed treatment of vegetable crops, Sudan grass, potatoes, and Douglas fir, foot rot of peas, leaf spot of spinach, bulb diseases of tulips, daffodils, lilies, and gladioli, control of leaf roll of peaches, brown rot of cherries, cane blights of blackberries yellows and root rot of strawberries and raspberries, and black root of beets; poultry husbandry, including changes in eggs from force molting yearling hens, eggshell quality as influenced by inheritance and prelaying calcium level, granulation of ingredients in poultry mashes, effect of season of hatch on albumin and shell quality, isolation v. nonisolation in brooding chickens, disease resistance, preserving grass and legume silage, and management of poultry house litter; veterinary science, including studies of avian leukosis, use of phenothiazine in control of enterohepatitis of turkeys, and erysipelas, paratyphoid infection, and hexamitiasis in turkeys; at Mt. Vernon, vegetable seed investigations on beets, potato breeding, control of the cabbage seed-pod weevil, maggot, and aphid, the pea moth, cabbage mosaic and other virus diseases, downy mildew, ring spot, and a *Phoma* leaf spot; and at Vancouver, variety tests of fruits, strawberry fertilizers, a prune disorder, boron for English walnuts, and variety tests with soybeans, sweet corn, potatoes, squash, muskmelons, and pumpkins.

Acta final de la III Conferencia Interamericana de Agricultura (Caracas, Venezuela: Litografia Com., 1945, pp. 98+).—This includes the programs and rules of procedure of the conference held in Caracas, Venezuela, from July 24 to August 7, 1945, a list of delegates, and the text of the 98 resolutions considered and recommendations adopted.

MISCELLANEOUS

Crofting agriculture—its practice in the West Highlands and Islands, F. F. DARLING (*Edinburgh: Oliver and Boyd, 1945, pp. 163+, illus. 20*).—This book deals with the agriculture of the region, with chapters on the soil, plant foods, the management of grass, the conservation of winter fodder, weed control, planning for the spring work, growing early potatoes, the problem of shelter, the crofter's cow and sheep, the principles of animal feeding, and agricultural arithmetic.

Colorado Farm Bulletin [January–February, March–April 1946] (*Colo. Farm Bul. [Colorado Sta.]*, 8 (1946), Nos. 1, pp. 15, illus. 10; 2, pp. 15, illus. 11).—In addition to articles noted elsewhere in this issue, No. 1 contains **How About Commercial Fertilizer**, by R. S. Whitney (pp. 12–14), and **What the College is Doing with Artificial Insemination**, by H. R. Lascelles (p. 15); and No. 2, **What Is Artificial Insemination**, by V. D. Stauffer (pp. 12–13).

Farm Research [April 1946] (*Farm Res. [New York State and Cornell Stas.]*, 12 (1946), No. 2, pp. 20, illus. 11).—In addition to articles noted elsewhere in this issue, this number contains **Plan Better Houses for Rural Folk**, by G. Morin (pp. 3–4) ([N. Y.] Cornell Sta.); **More and Better Meat Possible for Farm Families**, by J. I. Miller (p. 7) ([N. Y.] Cornell Sta.); **Flavor Plays Major Role in Determining Food Quality**, by Z. I. Kertesz (p. 14) (N. Y. State Sta.); **New York Livestock Goes to Market**, by W. M. Curtiss (pp. 15–17) ([N. Y.] Cornell Sta.); and **Quality in Maple Products**, by C. S. Pederson and F. W. Hayward (p. 16) (N. Y. State Sta.).

Bimonthly Bulletin [March–April 1946] (*North Dakota Sta. Bimo. Bul.*, 8 (1946), No. 4, pp. 31, illus. 7).—In addition to articles noted elsewhere in this issue, a list of scientific papers of the staff, and miscellaneous notes, this number contains **It Pays to Brood Pigs with Electricity**, by W. J. Promersberger and R. Witz (pp. 12–14), in which a hover type brooder is described; **Experiment Station Had Six Hens Each with 300-Egg Record Last Year**, by J. E. Parker (p. 19); and **North Dakota Farm Prices**, by P. V. Hemphill (pp. 30–31).

Farm and Home Science [March 1946] (*Farm and Home Sci. [Utah Sta.]*, 7 (1946), No. 1, pp. 12, illus. 15).—In addition to several articles noted elsewhere in this issue, this number contains **The Economic Situation as It Relates to Utah's Agriculture**, by W. P. Thomas (pp. 3, 11, 12); **Ladybird Beetle Mistaken for Pest**, by G. F. Knowlton (p. 4); and **Retention of Ascorbic Acid in Cabbage Salad**, by E. B. Wilcox and A. Maughan (pp. 5, 11).

Publications available from the [Kansas] Agricultural Experiment Station (*Kansas Sta. Cir. 232* (1945), pp. [4]).—This circular lists available publications on agricultural economics, agricultural production, and home economics.

Farmer's guide to agricultural research in 1944 (*Jour. Roy. Agr. Soc. England*, 106 (1945), pp. 1–74).—Brief summaries are given as follows: **Crops and Plant Breeding**, by G. D. H. Bell (pp. 1–12); **Diseases of Animals—Prevention and Treatment**, by T. Dalling (pp. 13–29); **Farm Economics**, by C. S. Orwin (pp. 30–41); **The Feeding of Livestock**, by W. Godden (pp. 42–49); **Farm Implements and Machinery**, by S. J. Wright (pp. 50–60); and **Soils and Fertilizers**, by E. M. Crowther (pp. 61–74).

NOTES

Alabama College and Station.—Dr. Charles F. Simmons has been appointed head of the department of agronomy and soils as of July 1. Dr. William E. Sewell, professor of animal husbandry and animal husbandman, has resigned to engage in commercial work.

Colorado College and Station.—Alvin Kezer, head of the department of agronomy, has retired after 37 years' service and was succeeded on July 1 by Dr. D. W. Robertson, station agronomist in cereal breeding.

Kansas College and Station.—L. E. Call, continuously associated with the institution since 1907, the first 18 years in agronomy work and subsequently as dean and director, has been given emeritus status following his appointment as chairman of the U. S. agricultural mission to the Philippines to co-operate with the Philippine Department of Agriculture in working out a national agricultural program. R. I. Throckmorton has been appointed dean and director and H. E. Myers head of the department of agronomy.

Louisiana University and Station.—Dr. A. H. Groth, associate professor of veterinary science and associate veterinarian, has been appointed director of the U. S. D. A. Animal Disease Regional Laboratory vice Dr. B. T. Simms, who several months ago became chief of the U. S. D. A. Bureau of Animal Industry.

Massachusetts College and Station.—An extension of the college to be known as the Massachusetts State College at Fort Devens has been established at the deactivated Army post at Ayer. This extension has been arranged to accommodate veterans qualified to undertake college training but who have been unable to gain college admission elsewhere because of limited quotas and facilities. Eligibility is restricted to male veterans who are residents of the State. Two years of accredited college work will be offered with privilege of transferring to the main campus in Amherst or to other institutions. Dr. Edward Hodnett has been appointed vice president in charge, with Dr. Wentworth Williams as dean of the faculty and Dr. Joseph Morgan Stokes as dean of men.

Philip H. Smith, associated with the station since his graduation in 1897, has retired as chief of the laboratory of feed and fertilizer control.

Michigan College and Station.—The pasture facilities of the institution, depleted by veterans' housing projects, have been increased by the purchase of 40 acres of land adjacent to the college farms.

Dr. Rufus H. Pettit, head of the department of entomology for 26 years prior to his retirement in 1933, died June 1 at the age of 77 years. A native of New York and a graduate of Cornell University in 1895, he spent a short time as assistant State entomologist in Minnesota, coming to Michigan in 1897.

Nebraska University and Station.—Dr. Raymond L. Borchers has been added to the staff in agricultural chemistry, chiefly for work in poultry nutrition.

Nevada University and Station.—Director S. B. Doten retired June 30, terminating a continuous service at the institution of 48 years, including instruction in history, mathematics, meteorology, and entomology, research as station entomologist from 1906 to 1913, and subsequently as director. He has been

succeeded by C. E. Fleming, previously in charge of range management investigations.

Cornell University.—An appropriation of approximately \$27,000 by the last Legislature is available for establishing two branch laboratories of the New York State Veterinary College for the diagnosis and study of poultry diseases. One laboratory is to be located at East Aurora to serve the western part of the State and the other at Kingston to serve the eastern area.

The first session of a new type of school was held at the College of Agriculture during the week of August 12. This was a bankers' school of agriculture which was sponsored by the State Bankers' Association.

Recent appointments include Dr. E. Lee Vincent as dean of the College of Home Economics, effective September 1; Vera Caulum as assistant State leader of home demonstration agents and assistant professor of home economics; and Arthur E. Durfee as assistant professor of extension teaching and information.

New York State Station.—Dr. Morrill T. Vittum has been appointed assistant professor of vegetable gardening.

North Carolina College.—Dr. Jane S. McKimmon, assistant director of extension since 1922, has retired. James T. Conner, Jr., has been appointed extension entomologist vice J. Myron Maxwell who is now in private business.

Pennsylvania College and Station.—The retirement on June 30 is noted of Dr. E. B. Forbes, head of the Institute of Animal Nutrition since 1922 and previously associated with entomological studies in Minnesota, animal husbandry work in Illinois and Missouri, and as chief of the department of nutrition in the Ohio Station; C. O. Cromer, professor of farm crops since 1920 and previously in similar work at the Purdue Station for 14 years; and F. W. Haller, assistant in horticulture since 1921.

G. W. Hedlund has resigned as the head of the department of agricultural economics to accept a professorship at the Cornell University and Station, and LeRoy Voris as assistant professor of animal nutrition to remain in the armed forces. Recent appointments include M. E. John as head of the newly established department of agricultural economics and rural sociology, and R. W. Swift as acting head of the department (formerly the institute) of animal nutrition.

Tennessee University and Station.—Director C. A. Mooers, continuously associated with the station since his graduation from the university in 1893 except for about a year as chemist in the Louisiana Station, retired on June 30. He had been director since 1923. Dean C. E. Brehm has been appointed director, with Frank S. Chance, the assistant director, becoming vice director.

Texas Station.—Dr. R. D. Lewis, chairman of the department of agronomy in the Ohio State University, has been appointed director, effective September 1.

Utah College.—At the recent commencement the honorary D. Sc. degree was conferred on Dr. William Peterson '99, extension director emeritus, and in absentia on Dr. James T. Jardine '05, chief of the U. S. D. A. Office of Experiment Stations.

Vermont Station.—C. H. Jones and L. S. Walker, chemists since 1896 and 1927, respectively, have been retired with emeritus status.

Washington Station.—George A. Olson, associated with the chemical work of the station from 1911 to 1921, the last 10 years as head of the division of agricultural chemistry, died July 29. He had also served on the chemical staff of the Wisconsin University and Station and from 1921 to 1928 was agricultural director of Gypsum Industries.

Office of Experiment Stations.—Dr. James T. Jardine, chief since 1931, retired on July 31, terminating a notable career in the Department of Agriculture of nearly 30 years in several capacities, including that of director of research from 1936 to 1941. In addition, he had served over 10 years as director of the Oregon Experiment Station. On August 1 he was succeeded by the assistant chief, Dr. Robert W. Trullinger, and he in turn by Erwin C. Elting, previously principal experiment station administrator (animal husbandry).

The recent retirement after long service of two members of the staff of *Experiment Station Record* is also noted. Fred G. Harden, principally engaged in recent months in abstracting the literature on agricultural economics, ended on July 31 a service which began with the Division of Irrigation Investigations in 1908 and had included an unusual range of duties. Dr. George Haines, in charge of the sections on animal genetics, animal husbandry, and dairying, retired on August 23 after nearly 25 years of continuous service.

Dr. Floyd Andre, principal experiment station administrator (entomology), has resigned to become assistant director of the Wisconsin Station.

U. S. Department of Agriculture.—R. H. Allee, assistant chief of the technical collaboration branch, U. S. D. A. Office of Foreign Agricultural Relations, has been appointed director of the Inter-American Institute of Agricultural Sciences in Costa Rica, vice Dr. E. N. Bressman.

W. A. Wheeler, chief of the seed marketing division of the Production and Marketing Administration, retired June 30 after 30 years of service, largely with hay, feeds, and seeds. Before coming to the Department he had been associated with the University of Minnesota and the South Dakota College and Station.

W. A. Lloyd, from 1913 to 1940 a member of the Extension Service staff and previously agriculturist for 4 years with the Ohio Station, died in Washington, D. C., July 10 in his seventy-sixth year. Since his retirement from the Department, he had been Washington representative of the Association of Land-Grant Colleges and Universities.

Flannagan-Hope Act for Agricultural Research.—This act, signed by President Truman on August 14, authorizes a much broadened agricultural research program. While no funds were appropriated prior to the adjournment of Congress, a total of \$9,500,000 is authorized to be appropriated in the 1947 fiscal year for agricultural research and marketing services, with special emphasis on the utilization of farm products, the marketing, handling, storage, processing, transportation, and distribution of these products, and cooperative production research. The principal objective, as stated by its authors and sponsors, is to give agriculture parity with industry in the field of research.

As brought out in a recent explanatory statement by the U. S. D. A. Office of Information, basic agricultural research, now carried out under various grants by Congress, is greatly expanded by the terms of the new measure. Title I of the act broadens the authority of the Bankhead-Jones Act of 1935 and provides for payments to the States for additional research on farm problems, particularly those of recent origin and any that may develop later. The fields of research include improved methods of production, problems of human nutrition, discovery of new and useful crops, expanded uses for farm products, and conservation and development of land, forest, and water resources for agricultural purposes.

A major share of the expanded research work will be done by State agricultural experiment stations. An equal allotment of 20 percent of the funds

to each State and Territory and Puerto Rico is provided, with additional allotments on the basis of rural and farm population ratios and the need for cooperative research on regional problems. The initial appropriation is \$2,500,000, which may be increased annually until it totals \$20,000,000 by the fifth year, but a condition for receiving 72 percent of the funds for this type of research is that the several States must match the Federal funds with State appropriations. A fifth of the funds allocated to the States must be earmarked for research in marketing.

A separate provision of \$1,500,000 in 1947 is authorized for cooperative agricultural research conducted by the Department, the State stations, and other appropriate agencies. This may be increased by \$1,500,000 annually until it totals \$6,000,000.

The act permits the Secretary of Agriculture to contract for the service of public or private organizations in carrying out utilization research if it promises more effective or economical results. However, the utilization research is to be conducted so far as practicable in the Department's laboratories. An initial appropriation of \$3,000,000 is authorized to be made for 1947, which may rise to \$15,000,000 in 1951.

Aiming at a reduction in the spread between farm prices and costs to consumers, title II of the legislation, citable as the Agricultural Marketing Act of 1946, provides funds and authority to expand research and service in the marketing, transportation, and distribution of agricultural commodities. In this field, too, the Secretary of Agriculture may contract with outside agencies for research services. Authorization is also given for making allotments of funds to State departments of agriculture, State bureaus and departments of markets, State agricultural experiment stations, and other agencies for cooperative research projects. An appropriation of \$2,500,000 is authorized to be made for 1947 to conduct this research and service, and annual increases may raise this amount to \$20,000,000 in 1951. These funds would be in addition to all other funds available for marketing activities.

In title III the establishment by the Secretary of Agriculture of a National Advisory Committee of 11 members, 6 of whom are to be producer representatives, is provided. This committee must meet at least quarterly and will make recommendations regarding the research and service work and assist in obtaining cooperation of affected groups and Federal and State agencies. Other committees may also be set up by the Secretary to assist in effectuating specific research and service programs.

EXPERIMENT STATION RECORD

Vol. 95

OCTOBER 1946

No. 4

RECENT WORK IN AGRICULTURAL SCIENCE¹

AGRICULTURAL AND BIOLOGICAL CHEMISTRY

Some correlations of growth-promoting powers of proteins with their strepogenin content, D. W. WOOLLEY (*Jour. Biol. Chem.*, 162 (1946), No. 2, pp. 383-388).—When mice were fed a highly purified ration in which casein hydrolysate plus tryptophan and cystine was the nitrogen source, they grew at a submaximal rate. Small proportions of proteins rich in "strepogenin" (a name tentatively assigned to "a factor (or factors) which stimulates the growth of *Lactobacillus casei*, some hemolytic streptococci, and certain other micro-organisms") were effective growth promoters, while proteins low in this peptidelike growth factor were not. Concentrates of strepogenin prepared from tryptic digests of casein were as active as the intact protein. When the strepogenin was destroyed in such concentrates, the growth-promoting powers for mice were lost. When egg white, a protein low in strepogenin but otherwise nutritionally adequate, was used as the source of nitrogenous matter in a highly purified ration, a slow rate of growth was observed. The growth rate produced by this diet was accelerated by administration of small proportions of proteins rich in strepogenin but not by those poor in this factor. Some implications of these findings with respect to current theories of protein nutrition are indicated. A stimulation of growth caused by the addition of heated starch to highly purified rations is described.

The effect of proteolytic enzymes on raw and heated casein, N. R. ELDERED and G. RODNEY (*Jour. Biol. Chem.*, 162 (1946), No. 2, pp. 261-265).—The combined action of crystalline pepsin, trypsin, and chymotrypsin on raw and heated casein was studied. Digestion of the heated substrate did not differ greatly from that of raw casein, but the available lysine, as determined by the specific enzyme lysine decarboxylase, was appreciably less. Similar results were obtained with crude pancreas as the source of proteolytic enzymes.

The effect of certain experimental conditions on the formation of thyroxine from diiodotyrosine, E. P. REINEKE and C. W. TURNER. (Mo. Expt. Sta.). (*Jour. Biol. Chem.*, 162 (1946), No. 2, pp. 369-375 illus. 1).—Diiodotyrosine dissolved in 0.116 N sodium hydroxide (pH 9.4 to 9.6) was incubated with vigorous stirring for 18 to 20 hr. under various conditions,

¹ The publications abstracted in these columns are seldom available for distribution by the Office of Experiment Stations. In general, application should be made to the Office of Information of the U. S. Department of Agriculture, Washington 25, D. C., for publications of the Department; to the directors of the State agricultural experiment stations, as listed on page 3 of the cover of this issue, for publications of the several experiment stations; and to publishers of books and journals for material issued by them. Microfilms and photostatic copies, the latter legible without magnifying equipment, may be purchased from the Library, U. S. Department of Agriculture, Washington 25, D. C. Rates and other details will be supplied by the Library on request.

and the quantity of thyroxine formed was determined by isolation of the crystalline product. It was found that a definite temperature optimum for the formation of thyroxine under these conditions occurs at 60°C. Thyroxine formation during the incubation was greatly accelerated by atmospheric oxygen, whether incorporated by stirring or by direct aeration. Only traces of thyroxine were formed in solutions that were neither stirred nor aerated. Manganese oxide was shown to catalyze the reaction in the presence of atmospheric oxygen. With all of the known conditions at the optimum, a yield of thyroxine equivalent to 0.85 percent of the diiodotyrosine taken initially was obtained. When allowance was made for the recovery of unaltered diiodotyrosine, this was equivalent to a net yield of 2.8 percent. The identity of the thyroxine was verified by its iodine content of 65.2 percent and melting point of 230°–231°. The thyroxine was optically inactive, apparently because of racemization under the conditions of incubation employed.

The biological conversion of *l*-serine to glycine, D. SHEMIN (*Jour. Biol. Chem.*, 162 (1946), No. 2, pp. 297–307).—Amino acids, labeled with N^{15} , together with benzoic acid were injected into rats and guinea pigs and the isolated hippuric acid was analyzed for its N^{15} concentration. By comparison of the dilution factor C_0/C ($C_0 = N^{15}$ concentration of administered compound, $C = N^{15}$ concentration of hippuric acid) of several amino acids with that found for glycerine and ammonia, it was found that only *l*-serine is directly converted, with utilization of carbon and nitrogen, into glycine in the rat and guinea pig. It appeared from the data that a considerable fraction of *l*-serine was converted to glycine. The mechanism of this conversion was established by employing serine labeled with N^{15} in the amino group and with C^{13} in the carboxyl group. It was found that *l*-serine is converted into glycine by the splitting off of the β -carbon atom. It was also found that the $N^{15} : C^{13}$ ratios of the administered serine and of the glycine of the excreted hippuric acid are essentially the same. The formation of some of the amino acids is discussed.

The structure of an egg albumin-detergent complex, K. J. PALMER. (U. S. D. A.). (*Jour. Phys. Chem.*, 48 (1944), No. 1, pp. 12–21, illus. 5).—The author postulates a structure for a denatured egg albumin-detergent complex which appears to be in agreement with the results of an electrophoretic investigation of this system. It consists of a polar protein monolayer with the detergent molecules absorbed on one side only and with the long axes of the detergent molecules perpendicular to the protein layer. On the basis of this structure it is suggested that the polar amino acids probably alternate along the peptide chain in egg albumin. From this hypothesis it follows that if the layer structure for native egg albumin postulated by Pauling is acceptable, the layers in the native configuration are polar. By use of this model a plausible structure for the complex which forms between native egg albumin and detergent is postulated. This structure is considered to account for the observed facts that the complex formed from native egg albumin never contains less than 25 percent of the commercial detergent used (whereas that formed from denatured egg albumin does), and that the complex containing 75 percent "native" egg albumin and 25 percent detergent can exist in equilibrium with free native protein.

Pea starch, a starch of high amylose content, G. E. HILBERT and M. M. MACMASTERS. (U. S. D. A.). (*Jour. Biol. Chem.*, 162 (1946), No. 2, pp. 229–233, illus. 5).—Starch belonging to an entirely new class was found to occur in three varieties of garden type, wrinkled seeded peas. The granules

did not gelatinize completely even after prolonged heating in a boiling water bath. The pea starch-water systems heated to 97°C. resemble suspensions rather than pastes, and a paste is not formed even after heating the system to 120° for 1 hr. Iodine-sorptive capacity and fractionation of the starch show the amylose content to be 60 to 70 percent, depending upon the variety of peas. No starch with so high an amylose content or such unusual physical characteristics has hitherto been reported.

Dough development and mechanical gluten dispersion in relation to amount of mixing and to the flour-water ratio, C. O. SWANSON and A. C. ANDREWS. (Kans. Expt. Sta.). (*Cereal Chem.*, 22 (1945), No. 1, pp. 60-75, illus. 3).—The authors found that in dough made slack by extended treatment with the pull-fold-repull action of the mixograph or dough mixer used in making baking tests, gluten was finely dispersed among the starch granules. Such gluten was not readily separated by the process of washing in water. It had suffered no apparent change in constitution and could be separated as a rubbery wad by appropriate methods. The use of the Waring blender together with the centrifuge was the best method for separating the gluten from the most severely treated doughs. By this method most of the starch was separated and then excess water in the foam was removed. Gluten from doughs mixed as long as 36 min. in the mixograph or to a paste in a high-speed baking-test mixer was successfully separated. Dispersion of gluten which produced the difficulty in separation by washing took place much more slowly in slack or very soft doughs than in stiff doughs. Gluten was readily separated from batters made stiff by the addition of starch. Very soft doughs, 90 percent absorption, when mixed a long time stiffened into a soft dough from which gluten was readily washed. The rate at which a dough developed from a very soft dough of Tenmarq was much slower than for Chiefkan. Greater differences in mixogram patterns of Tenmarq and Chiefkan were obtained by using soft doughs than by using stiff doughs.

The composition of the "amyloextrin" fraction of wheat flour, M. M. MACMASTERS and G. E. HILBERT. (U. S. D. A.) (*Cereal Chem.*, 21 (1944), No. 6, pp. 548-555, illus. 2).—The so-called amyloextrin, small-granule or tailings fraction separated by centrifuging crude wheat starch after the removal of the bran and gluten, was found to be composed of very small starch granules, proportions of damaged large granules varying with the severity of the milling, and smaller quantities of protein, fatty acids, ash, and pentosans, and cellulose in the cell wall debris. The damaged granules gelatinized in cold water. There was evidence of relatively little degradation of the starch. Large sorptive surfaces of the small granules, together with high ash content, suggested that the semi-fluid consistency of the fraction was due at least in part to an electroviscous effect.

Effect of the sulfurous acid steep in corn wet milling, M. J. COX, M. M. MACMASTERS, and G. E. HILBERT. (U. S. D. A.). (*Cereal Chem.*, 21 (1944), No. 6, pp. 447-465, illus. 10).—The authors describe a microscopic technic for the study in situ of the changes which occur in structural protein when corn kernels are subjected to various conditions. It was found that sulfurous acid in the steep used in the wet-milling process for cornstarch extraction had a specific effect in facilitating the separation of starch from protein. A technic was developed whereby the starch granules could be removed from a section of the kernel, leaving the protein network clearly visible. Birefringence of this network indicated that the molecules in it were largely oriented. Considerable peptization of the protein was effected when corn kernels were subjected to a sulfurous acid steep. At 38° to 43°C., a 0.2-per-

cent sulfur dioxide steep left much of the protein in globules or in strands ending in globules. At 49° to 55°, greater dispersion of the protein resulted from steeping, and globules were found only in the cells just under the aleurone, where protein packing was most dense. The steep caused more complete protein despersion, the higher the temperature (38° to 55°) and the greater the sulfur dioxide content (0 to 0.4 percent). Sulfurous acid appeared to effect disintegration and dispersal of the protein matrix more by its reducing action than by its acidity. It could not be successfully substituted by lactic, acetic, or hydrochloric acid in equivalent concentration or by acetic or hydrochloric acid at the same pH. Addition of lactic acid to a sulfurous acid steep increased softening of the kernel. Both glutinous and nonglutinous cornstarch contained more nitrogen and phosphorus and had lower paste viscosity the higher the sulfur dioxide content of the steep used prior to extraction (from 0 to 0.4 percent). In glutinous cornstarch, the ash content also was greater. The fat content of the starch was not affected by the steep. It was difficult or impossible to separate prime-quality starch from corn dried artificially at high temperatures, because the protein adhered to the starch granules with unusual tenacity. The difficulty was greater the higher the temperature at which the corn had been dried. The specific action of sulfurous acid in the steep was to disintegrate the protein matrix throughout the kernel, and, in consequence, to facilitate complete hydration with consequent softening of the kernel. This action is suggested to be due mainly to the reducing action of the sulfurous acid. Bleaching of the starch by the sulfurous acid during steeping was apparently negligible.

The pigments of cottonseed, C. H. BOATNER. (U. S. D. A.). (*Oil & Soap*, 21 (1944), No. 1, pp. 10-15, illus. 8).—A method for the purification of gossypol which yields material differing in optical properties from those previously reported for gossypol preparations is described, together with a colorimetric test for extractable gossypol. It was shown that cottonseed contains at least three pigments in addition to gossypol. Some of the properties of the three pigments are reported. One of these newly detected pigments, here designated "gossypurpurin," was found to be the substance which, mixed with gossypol, constitutes the so-called "red gossypol." The water-dispersible blue pigment of cottonseed appeared to be either a complex of gossypol, gossypurpurin and protein, or a mixture of two protein-pigment complexes. The blue substance was separated into two pigments and a protein component.

Dilatometric investigations of fats, I, II. (U. S. D. A.). (*Oil & Soap*, 21 (1944), No. 9, pp. 251-256, illus. 7).—Of these two papers, the first emphasizes especially some of the less obvious sources of technical error while the second reports results of measurements upon various individual fats.

I. *Apparatus and techniques for fat dilatometry*, A. E. Bailey and E. A. Kreamer (pp. 251-253).—The authors here discuss volume changes associated with phase transformations in fats and the general procedure applicable in dilatometric measurement; describe forms both of volumetric and of gravimetric dilatometer found to be suitable for work with fats; discuss certain precautions necessary to the accurate computation of volume changes in the fat; and detail the procedure adopted for the measurements.

II. *Dilatometric behavior of some plastic fats between 0°C. and their melting points*, E. A. Kreamer and A. E. Bailey (pp. 254-256).—The fats here reported upon are: Lard, butterfat, cottonseed oil, peanut oil, a commercial margarine oil, a commercial all-hydrogenated vegetable shortening, three samples of soybean oil hydrogenated to different degrees, a hard butter

fractionally crystallized from hydrogenated peanut oil, a mixture of tristearin and soybean oil, and a synthetic fat containing equal molar proportions of stearic and oleic acids.

The dilatometric curves of volume change in the fat against temperature were in every instance composed of a series of straight lines, separated by sharp break or transition points. The number of linear sections in the dilatometric curves corresponded generally with the known degree of complexity in the glycerides of the fats, and varied from two in the case of the relatively simple stearic-oleic glyceride mixture, to at least seven in the case of the all-hydrogenated shortening. Since each break in the curve must correspond to the disappearance of a distinct class of solid glycerides or glyceride complexes, the application of dilatometry to the qualitative and quantitative determination of glyceride composition in fats as suggested. Only two of the fats examined, a mixture of tristearin and soybean oil and a synthetic stearic-oleic glyceride mixture, exhibited polymorphism, even after rapid solidification in ice water.

Stability values of fats by the active oxygen method and by storage in glass vials, R. W. RIEMENSCHNEIDER and R. M. SPECK. (U. S. D. A.) (*Oil & Soap*, 22 (1945), No. 1, pp. 23-25).—The stability of lards containing various antioxidants was determined by the active oxygen method and by storage in glass vials at 21°C. In many instances there was general agreement in the results, but no constant relationship was found. The difference between the results of the rapid test and those of the storage tests seemed to be greatest when tocopherol concentrate and lecithin were added to lard. In most instances in which antioxidants were used, the protection indicated by the rapid stability test was higher than that found in the storage test.

The fluorescence of chlorophyll in fats in relation to rancidity, C. S. FRENCH and W. O. LUNDBERG. (*Oil & Soap*, 21 (1944), No. 1, pp. 23-27, illus. 2).—The disappearance of chlorophyll fluorescence in ultraviolet light caused by the addition of cottonseed oil appeared to be due to the absorption of the light by the cottonseed oil and to the intense white fluorescence of the oil itself rather than to a chemical reaction of some constituent of the oil with the excited chlorophyll. There was no evidence of a stoichiometric quenching reaction between the chlorophyll and acceptor substances in the fats used in this study, and, in consequence, no "endpoint" was observed in any of the titrations. A lack of correlation between either the peroxide value or the stabilities measured in conventional ways and the amount of chlorophyll fluorescence of several fats made the "chlorophyll value" test appear to have doubtful value as a generally applicable test for fat rancidity or stability. The crude absorption curves suggested that the greater absorption of near ultraviolet light by oxidized fats may be related to their content of fat peroxides.

The fats and phosphatides in grass, B. REWALD (*Oil & Soap*, 21 (1944), No. 2, pp. 50-52).—Analyses of dried grass [species or varieties not specified] showed the total of fats and fat-like substances, phosphatides, and waxes to amount to somewhat more than 7 percent. Most of the phosphatides could be extracted only with a solvent mixture including alcohol. The author holds that true phosphatides can without doubt be separated, but that other phosphorus-containing ones are present in small quantities. The total phosphatide content of dry grass was found at least 0.5 percent.

Notes on the stabilization of oxidized fats by steam deodorization with phosphoric acid or commercial lecithin, A. E. BAILEY and R. O. FEUGE. (U. S. D. A.). (*Oil & Soap*, 21 (1944), No. 10, pp. 286-288, illus. 2).—When a

normal fat containing tocopherols was to be stabilized by the addition of lecithin or phosphoric acid, these substances were as effective if added before deodorization as if added afterwards. When such a fat was oxidized until nearly rancid, these antioxidants were much more effective if added before the fat was deodorized. Lecithin and phosphoric acid were equally effective for the treatment of oxidized fats in the deodorizer. There was an optimum proportion of each to be used; the most effective stabilization was obtained with about 0.1 percent lecithin and 0.004 percent phosphoric acid. The optimum percentages of the two were approximately equal, on the basis of the phosphorus content of the materials. Oils deodorized with the optimum quantity of lecithin (0.1 percent) darkened in color in the deodorizer, although there was no darkening when 0.02 percent lecithin was used. The optimum quantity of phosphoric acid (0.004 percent) had no adverse effect on the color. Little phosphorus, either as lecithin or as phosphoric acid, was removed by steam deodorization. In spite of the fact that lecithin and phosphoric acid had a superior stabilizing effect when added to oxidized fats before deodorization, there was no evidence of any regeneration of tocopherols from tocoquinone in the deodorizer. On the contrary, deodorization with these materials appeared to convert tocopherols partially to tocoquinones or other nonreducing chromans.

Comparison of fat-splitting reagents in the Twitchell process, A. J. STIRTON, E. M. HAMMAKER, S. F. HERB, and E. T. ROE. (U. S. D. A.). (*Oil & Soap*, 21 (1944), No. 5, pp. 148-151, illus. 1).—Commercial petroleum sulfonic acid reagents were compared with Twitchell reagents, alkylaryl-sulfonic acids, and sulfoarylstearic acids as fat-splitting reagents in the hydrolysis of lard oil, tallow, cottonseed oil, garbage grease, and inedible grease. The best reagents were made from commercial wetting agents of the alkylarylsulfonate type. Sulfoxylyl-stearic acid, seven petroleum sulfonic acids, and four Twitchell reagents followed in order of decreasing effectiveness. Observations were made on the distribution of the fat-splitting reagent between phases, the necessity of removing the sweet water [aqueous glycerin solution] before completion of hydrolysis, and the effect of the fat-splitting reagent upon the color of the crude fat acids.

Spectrophotometric determination of small proportions of polyunsaturated constituents in fatty materials, B. A. BRICE, M. L. SWAIN, B. B. SCHAEFFER, and W. C. AULT. (U. S. D. A.) (*Oil & Soap*, 22 (1945), No. 9, pp. 219-224).—Ultraviolet spectrophotometric methods were modified for application primarily to the detection and estimation of low proportions of conjugated and nonconjugated unsaturated constituents in fats, oils, and soaps. The method was found applicable also to fatty materials having high proportions of these constituents. Modifications included corrections for absorption by interfering substances, use of alkaline glycerol as an isomerization medium in the analytical procedure, and correction of absorption data on the isomerized product for absorption by conjugated constituents in the material before isomerization.

The presence of small proportions of highly unsaturated conjugated and nonconjugated compounds in lards, tallows, tallow soaps, and highly purified esters and acids was established. Fatty acids of tall oil were shown to contain approximately 10 percent of conjugated diene acids and a small amount of linolenic acid.

The effect of fat on the utilization of galactose by the albino rat, R. P. GEYER, R. K. BOUTWELL, C. A. ELVEHJEM, and E. B. HART. (Wis. Expt. Sta.) (*Jour. Biol. Chem.*, 162 (1946), No. 2, pp. 251-259).—Fat increased the utili-

zation of galactose by the rat when either lactose or galactose was ingested. This phenomenon occurred on milk or synthetic type rations. The percent of the ingested galactose lost in the urine was independent of the actual amount of galactose ingested, but was dependent on the percent of galactose in the ration.

Measurement of the consistency of plastic vegetable fats: A standard micro-penetration technic, R. O. FEUGE and A. E. BAILEY. (U. S. D. A.). (*Oil & Soap*, 21 (1944), No. 3, pp. 78-84, illus. 10).—The authors describe an improved micropenetrometer by means of which it is possible to measure the consistency of fats with a high degree of precision. Since "the intelligent use of a micropenetration method requires some consideration of the theory of plasticity in fats, this theory is briefly discussed." The influence of various factors on the consistency of solidified fats was investigated, and a standard technic for making micropenetration tests is proposed. Micropenetration data on cottonseed, peanut, and soybean oils hydrogenated to different degrees, on cottonseed oil blended with various proportions of highly hydrogenated oil, and on various commercial samples of shortening and margarine are recorded. A quick micropenetration method, applicable as a control in the hydrogenation of fat products, is described.

Thermal properties of fats and oils, I-V. (U. S. D. A.). (*Oil & Soap*, 21 (1944), No. 10, pp. 293-302, illus. 7; 22 (1945), Nos. 1, pp. 10-13, illus. 1; 2, pp. 39-41, illus. 2).—These five papers deal with the setting up of suitable calorimetric equipment and measurements of some properties of cottonseed oil, its hydrogenation products, and other fatty substances.

I. *Apparatus and techniques for low temperature calorimetry*, A. E. Bailey, S. S. Todd, W. S. Singleton, and G. D. Oliver (pp. 293-297).—A low-temperature calorimeter suitable for the examination of fatty materials with moderate accuracy is described and its method of use outlined. The applications of calorimetry in the examination of fats and fatty materials are discussed.

II. *Heat capacity and latent heat of cottonseed oil*, G. D. Oliver, W. S. Singleton, S. S. Todd, and A. E. Bailey (pp. 297-300).—The heat contents of cottonseed oil, a hydrogenated cottonseed oil, and a mixture of cottonseed oil and petroleum naphtha were measured over ranges of temperature within which there is transformation of the glycerides of the oils from a completely solid to a completely liquid form. From the heat content data, determinations of the heats of fusion of the oils and of the specific heats of the oils in both solid and liquid states were made. Equations for expressing the best capacities of the oils and the oil-solvent mixture with the oil in either the liquid or solid form were derived. Values found for the specific heat of the liquid oils were in general agreement with values found by previous investigators. The values calculated for the heat of fusion of the oils were much lower than values reported by other workers for highly saturated glycerides. It is pointed out, however, that a low value for mixed glycerides of saturated and unsaturated fatty acids was to be expected from considerations of molecular structure.

III. *Calorimetric estimation of solid and liquid glycerides in cottonseed oil and hydrogenated cottonseed oil*, A. E. Bailey and G. D. Oliver (pp. 300-302).—The relative quantities of solid and liquid glycerides in cottonseed oil and a hydrogenated cottonseed oil were estimated calorimetrically at different temperatures over the melting ranges of the oils. A correlation between the content of solids in hydrogenated cottonseed oil and the consistency of the oil, as measured by micropenetrations, was established. From previous

micropenetration data on commercial fat products, it was established that such fats were plastic and easily worked only at solids contents between about 15 and 35 percent. Differences in the content of solids of as little as 1 percent were sufficient to cause noticeable differences in the consistency of plastic fats. Within the ranges of temperature and iodine value at which hydrogenated cottonseed oil was plastic, it was estimated that each decrease in iodine value of 1 unit caused the solid glyceride content of the oil to increase approximately 1 percent.

IV. *Some observations on the polymorphism and X-ray diffraction characteristics of tristearin and a highly hydrogenated cottonseed oil*, A. E. Bailey, M. E. Jefferson, F. B. Kreeger, and S. T. Bauer (pp. 10-13).—Melting points and X-ray diffraction patterns of cottonseed oil hydrogenated to an iodine value of less than 1 and of a very pure sample of tristearin were determined. Contrary to the observations of previous investigators, the X-ray patterns indicate a well-defined crystal structure with a sharp long spacing and a single sharp short spacing in the lowest-melting form of tristearin. A new pattern, with two short spacings and a long spacing, was observed in tristearin of intermediate melting point. Four polymorphic forms of the hydrogenated cottonseed oil were detected. The X-ray pattern of the lowest-melting form of the hydrogenated oil was similar to that of the corresponding form of tristearin. The pattern of the highest-melting form of the hydrogenated oil differed from that of either tristearin or β -palmitodistearin, the major components of the oil. Distinctive patterns for the intermediate forms of the hydrogenated oil could not be obtained, presumably because of the instability of the lower melting forms at room temperature.

V. *The heat capacity and heat of fusion of highly hydrogenated cottonseed oil*, G. D. Oliver and A. E. Bailey (pp. 39-41).—The heat content of a quickly chilled sample, and that of a slowly chilled and tempered sample, of almost completely hydrogenated cottonseed oil, was measured over a temperature range within which there was in each case complete transformation of the oil from a solid to a liquid form. Heat capacity data were calculated for the liquid oil and for the quickly chilled and the tempered solid oil. Equations expressing the changes in heat capacity with temperature were derived. A correlation of the heat capacity data on highly hydrogenated cottonseed oil and similar data previously obtained on unhydrogenated cottonseed oil, and on partially hydrogenated oil, in both liquid and solid states, is presented. The heat of fusion calculated for the quickly chilled and for the tempered solid oil is given.

Effect of deodorization and antioxidants on the stability of lard, R. W. RIEMENSCHNEIDER, S. F. HERB, E. M. HAMMAKER, and F. E. LUDDY. (U. S. D. A.). (*Oil & Soap*, 21 (1944), No. 10, pp. 307-309, illus. 1).—Deodorization produced no appreciable increase in the stability of steam-rendered lard but significantly increased the stability of kettle-rendered lard. A substantial increase in the stability of lard was produced by tocopherol, regardless of whether it was added as a pure compound, as a concentrate, or as a tocopherol-bearing oil. Accelerated tests showed that this increase was more than doubled when small amounts of synergists also were added. Deodorization of the lard prior to addition of the synergistic antioxidant compositions produced even greater stability. Nordihydroguaiaretic acid was more effective than tocopherol as an antioxidant for lard, as determined by both the active oxygen and the oxygen-absorption methods. Deodorization of the lard prior to addition of this antioxidant and synergists did not effect further increase in stability over that obtained by the addition of these materials

to undeodorized lard. In most instances, deodorization after the addition of synergistic compositions resulted in some decreases in stability, as compared with similar additions to the lard without deodorization.

Improvement produced in the stability of lard by the addition of vegetable oils. R. W. RIEMENSCHNEIDER, J. TURER, and W. C. AULT. (U. S. D. A.). (*Oil & Soap*, 21 (1944), No. 4, pp. 98-100).—As measured by an active oxygen method, the stability of lard could be increased appreciably by the addition of from 1 to 10 percent of any one of several vegetable oils. The increased stability thus obtained appeared to be closely related to the tocopherol content of the added oils. It is pointed out that since the tocopherols function most efficiently at lower levels and with decreasing efficiency at each successively higher level, it would seem possible to take advantage of a considerable part of the stabilizing action of these compounds without adding the vegetable oils or fats in excessively large quantities. Tocopherol thus added appeared to be capable of acting synergistically with certain other known antioxidants, such as *d*-isoascorbyl palmitate and commercial lecithin. At the same time, choice between the use of liquid fats or oils hydrogenated to various degrees of hardness appeared to allow a considerable measure of control over the hardness and plasticity of the finished product.

The fractionation of milk fat from a solvent at low temperatures. J. L. HENDERSON and E. L. JACK. (Univ. Calif.). (*Oil & Soap*, 21 (1944), No. 3, pp. 90-92, illus. 3).—A procedure for fractionating milk fat from a solvent at low temperature consists in freezing out fractions of the fat from solvent (a specified brand of petroleum spirit) at progressively lower temperatures -7° , -13° , -23° , and -53°C. , the remaining filtrate being taken as a final fraction. In physical appearance these fractions varied from a dry white powder to a reddish-yellow oil; in melting point from 53° to -10.6° ; in iodine number from 8.29 to 58.37; and in saponification equivalent from 262.8 to 235.2. The saponification equivalents did not change in the same order as the other properties mentioned. This fat fractionation effected a simplification of milk fat and made available less complex portions of the natural glyceride mixtures for detailed study of the composition, configuration, and other properties.

A bibliography on the solvent extraction of vegetable oils from raw materials, with special attention to soybeans. A. C. BECKEL. (U. S. D. A.). (*Oil & Soap*, 21 (1944), No. 9, pp. 264-270).—Groups of reference numbers referring to a following alphabetical author list are classified under the captions and subcaptions: Apparatus (continuous and batch); process (continuous and batch); reviews; principles, effects on oil and meal; hazards; byproducts; costs; and solvents (general; and ethyl alcohol, methyl alcohol, hexane, benzene, propane, trichlorethylene, ethylene dichloride, carbon dioxide, sulfur dioxide, butane, and carbon tetrachloride).

Effect of metallic salts on the stability of palm and hydrogenated cottonseed oils. S. T. BAUER and V. GASTINEL, JR. (U. S. D. A.). (*Oil & Soap*, 21 (1944), No. 2, pp. 36-42, illus. 5).—It was found that when palm and hydrogenated cottonseed oils were heated in the presence of tin to temperatures comparable with those obtaining during the hot dipping of tin, palm oil showed a slightly lower rate of increase in viscosity compared to hydrogenated cottonseed oil. When zinc and ferric salts were added to the otherwise similarly treated oils, hydrogenated cottonseed oil was found to be more stable than palm oil. Metallic contaminants such as ferric oxide, which had a marked effect on the rate of viscosity increase of palm oil, produced no change in the rate of increase in viscosity in the case of hydro-

genated cottonseed oil. The addition of zinc stearate, of zinc chloride alone, or of zinc chloride and ferric salt retarded polymerization of both oils, as measured by the rate of increase in viscosity. The addition of either ferric oxide or ferric stearate accelerated the rate of viscosity increase of the heated oils. It was concluded that the inorganic salts are partly converted to ferric and zinc soaps *in situ* by reaction with free fatty acids already present or formed in the heated oils. When palm oil was heated with various metallic compounds, it lost free fatty acids rapidly during the early stages of heating until the concentration attained a definite value, at which it remained during further heating. The concentration at which the free fatty acids in the palm oil became constant was directly affected by the specific nature of the added metallic compound. When hydrogenated cottonseed oil, having a lower initial content of free fatty acids than the palm oil was treated in the same manner, there was an accumulation of free fatty acids during heating until the concentration attained a definite value, after which it remained constant on further heating. The concentration at which the free fatty acids of any sample of oil became constant was found to be dependent on the specific nature of the added metallic compound.

Molecular distillation of a hydrogenated cottonseed oil and certain characteristics of the distilled fractions, W. S. SINGLETON and A. E. BAILEY. (U. S. D. A.). (*Oil & Soap*, 21 (1944), No. 6, pp. 157-159).—Fractionation of a hydrogenated cottonseed oil in a molecular distillation followed the course to be expected on the basis of differences between the glycerides in molecular weight, the composition of cottonseed oil permitting a considerable separation of glycerides in accordance with degree of unsaturation. Fractionation of a molecularly distilled oil occurred, as is to be expected, on the basis of variations in molecular weight of the glycerides. The composition of cottonseed oil was such that there was a considerable separation of the glycerides according to their degree of unsaturation. The composition of peanut oil was such that similar separation can only be slight. Soybean oil was in this respect intermediate between cottonseed oil and peanut oil. Molecular distillation of hydrogenated cottonseed oil caused a segregation of tocopherols and related compounds similar to that observed in peanut oil. However, the fractions first distilled from the oil were relatively weak in antioxygenic properties. It appeared probable that their lack of effectiveness was due to the presence of unknown substances capable of inhibiting or counteracting the action of tocopherols, but the presence of substances other than tocopherols which responded to or interfered with the Emmerie-Engel test could not be excluded. The tocopherols in the potent fractions were more effective than α -tocopherol, but less effective than γ -tocopherol.

Tocopherol concentrates by the fractional crystallization of cottonseed oil from solvents, W. S. SINGLETON and A. E. BAILEY. (U. S. D. A.). (*Oil & Soap*, 21 (1944), No. 8, pp. 224-226, illus. 2).—Tocopherol concentrates equivalent in tocopherol content and antioxygenic activity to molecularly distilled concentrates were obtained from cottonseed oil by hydrogenating the oil and removing the bulk of the glycerides and sterols by low temperature crystallization from acetone. Concentrates of high tocopherol content could be obtained only from hydrogenated oils. Completely hydrogenated oils were the best source of concentrates at crystallization temperatures down to -60°C . Below this temperature partially hydrogenated oils were equally good. A solvent : oil ratio of 8 : 1 by weight appeared to be about the optimum. At this ratio, crystallization from acetone at the temperature of dry ice (-78°C .) yielded a concentrate containing 34 percent tocopherols

from an oil originally containing 0.05 percent tocopherols. The direct addition of dry ice to the solvent and oil was to be avoided, since this lowered the recovery of tocopherols. Petroleum naphtha and methyl ethyl ketone were less suitable solvents than acetone because of their greater capacity for dissolving glycerides at low temperatures.

Gamma-tocopherol as a precursor of a red quinoid substance developed in cottonseed oil during oxidation, C. E. SWIFT, G. E. MANN, and G. S. FISHER. (U. S. D. A.) (*Oil & Soap*, 21 (1944), No. 11, pp. 317-320, illus. 5).—On the basis of spectrophotometric data showing the characteristic spectral absorptions observed in oxidizing substrates with and without added γ -tocopherol, it was concluded that the red color which develops on accelerated oxidation of fat substrates containing this tocopherol results from its conversion to chroman-5,6-quinone. The chroman-5,6-quinone thus produced showed relatively little antioxidant activity.

Oil from tumbling mustard seed, W. H. GOSS and J. E. RUCKMAN. (U. S. D. A.). (*Oil & Soap*, 21 (1944), No. 8, pp. 234-236).—A sample of the seed of *Sysimbrium altissimum* was obtained from wheat screenings and found to contain 5.46 percent moisture and 32.6 percent of an oil having a Wijs iodine number of 151.0. The oil-free residue of the seed contained 7.22 percent of nitrogen. By fractionation of the methyl esters of the fatty acids, the oil was shown to contain linolenic acid, 34.9 percent; erucic acid, 25.3 percent; linoleic acid, 19.0 percent; palmitic acid, 14.1 percent; palmitoleic acid, 1.0 percent, and 0.5 percent of unsaponifiable matter. The oil is compared, in a table showing the known fatty acid components, with other oils having important proportions of erucic acid. Although the tumbling mustard seed oil was found to fall far short, with respect to erucic acid content, of being an adequate replacement for rapeseed oil (of which the erucic acid content is given as 50.0 percent), it is noted that "the present trend in the oil and synthetic chemical industries is to consider the component fatty acids of an oil as potential raw materials for industrial products, and means for fractionating the oils and their acids to obtain technically pure materials are now being made available. In view of these developments, it will be of interest, and of considerable value to the oil trade, to procure information on the compositions of the oils in the several other types of weed seeds available as waste products of the grain-processing industries."

Valencia orange-seed oil, G. R. VAN ATTA and W. C. DIETRICH. (U. S. D. A.). (*Oil & Soap*, 21 (1944), No. 1, pp. 19-22, illus. 2).—On the basis of dry substance of the uncleaned seed, the oil content of the seed examined was 34.2 percent; of the clean, dry kernels, 55 percent. Processing data and observations from experiments on hydraulic and continuous pressing and solvent extraction and on refining, bleaching, and deodorizing are recorded. The characteristics and composition of the oil were investigated, individual saturated fatty acids having been determined by the method of fractionation of the methyl esters. On the basis of the total mixed acids, 20.7 percent of palmitic acid is reported, 4.7 percent of stearic acid, and 0.9 percent of arachidic acid.

With regard to possible uses, it was concluded that when refined, bleached, and deodorized the oil would be quite acceptable as a food oil.

Analyses of peanut kernels with relation to U. S. standards for farmers' stock peanuts, M. F. STANSBURY, J. D. GUTHRIE, and T. H. HOPPER. (U. S. D. A.). (*Oil & Soap*, 21 (1944), No. 8, pp. 239-247, illus. 3).—Average data for the oil and nitrogen content and for the iodine number of the oil, as determined by the authors for Spanish and for runner peanuts, were found to

agree fairly well with the values previously obtained by others. Statistical consideration of the figures indicated that probably two-thirds of all graded samples of Spanish and runner peanut kernels will have oil contents between 48.9 and 52.3 percent and nitrogen contents between 4.64 and 5.14 percent on the moisture-free basis. Similarly, two-thirds of all graded samples of Virginia peanut kernels should have oil contents between 4.64 and 50.4 percent and nitrogen contents between 4.46 and 5.08 percent.

Viscosities and densities of hydrogenated peanut oils, F. C. MAGNE and H. WAKEHAM. (U. S. D. A.). (*Oil & Soap*, 21 (1944), No. 12, pp. 347-349, illus. 2).—The viscosity and density data reported include those of oils from several varieties of peanuts grown at a number of experiment stations, the samples having been selected to cover as wide a range of iodine number as possible, together with measurements of the same properties of a group of hydrogenated oils prepared from a commercial alkali-refined and bleached peanut oil.

Molecularly distilled peanut oil antioxidants and pure α -tocopherol as stabilizing agents for fats of poor keeping quality, G. D. OLIVER, W. S. SINGLETON, and A. E. BAILEY. (U. S. D. A.). (*Oil & Soap*, 21 (1944), No. 7, pp. 188-193, illus. 10).—Molecularly distilled concentrates of peanut oil antioxidants and pure α -tocopherol were tested at 110°C. as agents for the stabilization of lard and abnormal peanut oil products of poor stability.

Neither the peanut oil concentrates nor α -tocopherol were effective in improving the stability of either raw or hydrogenated peanut oils. The addition of these substances materially reduced the stability of some of the oils. The results indicated that poor keeping quality in hydrogenated peanut oils is not in general due to a deficiency in tocopherols or related antioxidants alone. Both α -tocopherol and peanut oil antioxidants were effective stabilizers for lard in concentrations up to approximately 0.06 percent. Above this concentration, the addition of α -tocopherol did not materially extend the keeping time of the lard, and the addition of peanut oil antioxidants decreased the keeping time. Essentially similar relationships between antioxidant concentrations and effectiveness were observed at the lower levels of concentration of the two antioxidants. In an investigation of the kinetics of peroxide formation in lard containing various percentages of α -tocopherol, with increasing tocopherol concentration, the peroxide level at which rapid oxidation begins was found to increase constantly, whereas the initial rate of peroxide formation passed through a minimum. This is held to account for the antioxidant effect of low concentrations of α -tocopherol. At higher tocopherol levels the rate at which the peroxide level rose was balanced by the rate at which peroxide formation was accelerated, and there was consequently no stabilizing effect. No correlation between the rate of tocopherol disappearance and either peroxide concentration or rate of peroxide formation in accelerated tests of lard containing 0.5 percent peanut oil tocopherols or 0.5 percent α -tocopherol was observed. In these tests there was a considerable residue of unoxidized tocopherols remaining after the fat had become strongly rancid. The experimental results are considered strongly to suggest the presence of distillable substances in vegetable oils which are capable of inhibiting the action of tocopherols, or otherwise acting as pro-oxidants. The possibility that such substances are developed by oxidation but do not consist of peroxides is noted.

Relation between the fatty acid composition and the iodine number of soybean oil, C. R. SCHOLFIELD and W. C. BULL. (U. S. D. A.). (*Oil & Soap*, 21 (1944), No. 3, pp. 87-89, illus. 1).—It was found that over the entire

range of iodine numbers the percentages of total saturated and individual unsaturated fatty acids in soybean oil extracted in the manner described vary in a regular manner, within reasonable limits, according to the iodine numbers. Similar relations were observed whether the variables considered were the percentages of individual fatty acids and iodine numbers of the mixed acids, or the percentages of individual fatty acids in the mixed acids and iodine numbers of the oils. The proportions of individual fatty acids in the mixed fatty acids also represented the proportions of individual fatty acids as glycerides in the oil. The principal variation in fatty acid composition was the large decrease in oleic acid and the large increase in linoleic acid with increasing iodine number. Linolenic acid increased slightly with increasing iodine number, while the proportion of saturated acids was relatively constant for the entire range of iodine numbers.

Analysis and fatty acid composition of tobacco seed oils, R. W. RIEMENSCHNEIDER, R. M. SPECK, and E. G. BEINHART. (U. S. D. A.) (*Oil & Soap*, 22 (1945), No. 5, pp. 120-122).—The fatty acid composition of 12 samples of oil representing a number of different types and varieties of tobacco were determined by the thiocyanometric method. The samples were remarkably uniform in composition, containing on the average 75 percent linoleic, 15 percent oleic, and 10 percent saturated acids. Spectrophotometric determination of the linoleic acid content of two samples of oil gave values 3.0 and 5.4 percent higher than those indicated by the thiocyanometric method. A more complete investigation of the fatty acid constituents of one sample of flue-cured tobacco seed oil was carried out by analysis of fractions obtained by distillation of the methyl esters and by low-temperature crystallization of the distilled ester fractions. The composition calculated from these analyses agreed well with that determined from analysis directly on the oil. The saturated acids consisted of palmitic and stearic acids, the proportions being about 7 and 3 percent, respectively, of the total fatty acids. This sample of oil contained 0.043 percent of tocopherol.

On the basis of the composition determined in the investigation here noted, tobacco seed oil seemed particularly suitable for the manufacture of nonyellowing alkyds or for the preparation of technical linoleic acid.

Studies in the expression of oil from tung fruit, R. S. MCKINNEY, N. J. HALBROOK, and R. E. OGLESBEE. (U. S. D. A.). (*Oil & Soap*, 21 (1944). No. 12, pp. 353-357).—Best results in yield of crude and filtered oil by an expression procedure were obtained with a tung meal containing 4.2 percent moisture and 20 percent shell. The drying of tung meal with an initial air temperature of 320°F. appeared to affect adversely the yield of filtered oil from the expeller process. A filtration test was developed for determining the amount of foots in a crude tung oil. It was found difficult to obtain efficient oil expression from tung meals containing filter cake; in one test with this material the resulting press cake was high in oil content, while in another test the crude tung oil contained about twice as much foots material as was present in crude tung oil from tung meal containing no filter cake. The expression of tung oil from a tung meal consisting of ground old tung kernels and tung shell was found difficult if not impossible. This difficulty appeared to be due, at least partly, to the fact that the meal from old kernels would not plasticize when subjected to heat and pressure. When these kernels were mixed with new kernels no difficulty was experienced in expressing the tung oil from the meal. Tests indicated that hulling the moist tung fruit in the grove did not interfere with the expression of the oil if the moist dehulled tung fruits were properly dried before pressing. A process

for producing a clear tung oil by treating the crude oil with a chemical agent to precipitate certain nonoil constituents in the crude tung oil, followed by either pressure filtration or centrifugation, was developed. When tung oil filter cake was mixed with an equal amount of tung press cake, over 98 percent of the oil could be extracted by petroleum solvents.

Effect of moisture on grinding of tung kernels and solvent extraction of meal, A. F. FREEMAN, F. C. PACK, and R. S. MCKINNEY. (U. S. D. A.), (*Oil & Soap*, 21 (1944), No. 11, pp. 328-330).—Data showing the effects of moisture on grinding of tung kernels and no solvent extraction of oil from the resulting meal indicated that the efficiency of oil extraction can be materially increased by vacuum drying ground kernels before extraction. The state of comminution obtainable on grinding tung kernels was dependent upon moisture content; above 9 percent moisture content the efficiency of grinding, and consequently the efficiency of extraction, decreased progressively with increase of moisture content; the most efficient grinding was obtained with material of moisture content in the range of 6 to 9 percent; and, in general, progressively poorer grinding of tung kernels with moisture contents ranging downward from 6 percent was obtained.

A note on the composition of wheat-germ oil, S. B. RADLOVE. (U. S. D. A.), (*Oil & Soap*, 22 (1945), No. 7, pp. 183-184).—As a preliminary to an investigation of the possibilities for the increased industrial utilization of wheat oils, the proximate analysis of a commercially available wheat-germ oil was repeated "in the light of present conceptions of the significance of the analytical constants of the unsaturated fatty acids."

Fatty acid monoesters of l-ascorbic and d-isoascorbic acids as antioxidants for fats and oils, R. W. RIEMENSCHNEIDER, J. TURER, P. A. WELLS, and W. C. AULT. (U. S. D. A.). (*Oil & Soap*, 21 (1944), No. 2, pp. 47-50).—The fatty acid monoesters of l-ascorbic and d-isoascorbic acids were tested for antioxygenic activity in different fats and oils under various conditions and in combination with other inhibitors. Traces of soap were found to have a deleterious effect on the stability of fats. This deleterious effect could be counteracted by the use of fat-soluble ascorbyl monoesters. The ascorbyl monoesters used in combination with either α -tocopherol or phospholipids, or both, showed a marked synergistic antioxidant effect. Possible explanations are given for certain synergistic phenomena that have been observed.

Formation and decomposition of peroxides of unsaturated fat esters, R. F. PASCHKE and D. H. WHEELER. (U. S. D. A.). (*Oil & Soap*, 21 (1944), No. 2, pp. 52-57, illus. 12).—Distilled methyl esters of soybean fat acids were used because they were easy to prepare and could be readily purified by distillation. The difficulty involved in the preparation of the pure esters in quantities sufficient for exploratory work made their use in the experiments here dealt with impracticable. A study of reaction time and the effect of oxygen on determination of peroxide by acetic acid-potassium iodide method showed that a 1-hr. reaction time in the absence of oxygen was necessary, especially on samples of high peroxide. The peroxide-formation curves at 100°, 75°, 55°, 35°, and 15° [C.], showed a progressive increase in maximum peroxide value reached as the temperature was lowered to 35°. At 15°, the maximum was the same as 35°; this value was over 30 percent of what it would be if all the double bonds were converted to peroxide. The agreement between actual peroxide and "theoretical peroxide" calculated from decrease in iodine number extended to higher values as the temperature was decreased. The rate of decomposition or disappearance of peroxide at 100°, 75°, 55°, and 35° agreed best with that of a bimolecular reaction, but

definite exceptions existed. The speed of decomposition of peroxide became progressively greater as the degree of oxidation was increased. The changes in unsaturation, OH number, and acid number were small compared to the decrease in peroxide value as the peroxide decomposed. The formation of volatile and inflammable products was qualitatively observed in the decomposition of highly oxidized esters.

Some relationships between fat acid composition and the iodine number of linseed oil, E. P. PAINTER. (N. Dak. Expt. Sta.). (*Oil & Soap*, 21 (1944), No. 12, pp. 343-346, illus. 4).—Results of analysis of 148 linseed oil samples are summarized. When the constituent fat acid glycerides were plotted against the iodine number the points fell close to a straight line in the cases of saturated acids, oleic acid, and linolenic acid. Of the data for linoleic acid, however, the points were so dispersed that no significant relationship to the iodine number was apparent. Correlation coefficients between iodine number and the fat acids were: Linolenic, +0.97; oleic, -0.94; saturated, -0.80; and linoleic, -0.27. It was possible to estimate within limits the contents of linolenic, oleic, and saturated acids in linseed oil by applying equations where the iodine number was the only variable. For linoleic acid, however, the standard deviation along the regression line was almost equal to the standard deviation from the mean, although real differences in composition which were independent of the iodine number existed. The dispersion of the points along the regression lines was greater than would result from errors of precision in the analyses.

Purification of oleic acid, methyl oleate, and oleyl alcohol for use as chemical intermediates, D. SWERN, H. B. KNIGHT, and T. W. FINDLEY. (U. S. D. A.). (*Oil & Soap*, 21 (1944), No. 5, pp. 133-139).—Oleic acid, methyl oleate, and oleyl alcohol of high purity (93 to 96 percent) were prepared from readily available and inexpensive commercial materials in 65 to 70 percent yields by fractional distillation and a single low-temperature fractional crystallization. The starting material for the preparation of the purified oleic acid and methyl oleate was commercial red oil. The oleyl alcohol preparation was made from a commercial grade containing a little more than 70 percent of the desired compound. In the fractional distillation of red oil and its methyl esters, lower fractions amounting to about 20 percent of the starting material were obtained. These are suggested for use in soap manufacture. A fraction containing more than 50 percent linoleic acid was obtained from the C-18 fraction of red oil by fractional crystallization. This fraction amounted to about 20 percent of the total starting material and had approximately the same percentage composition with respect to fatty acids as several important semi-drying oils.

Solidification points of binary mixtures of caprylic and capric acids, H. A. SCHUETTE and H. A. VOGEL. (Univ. Wis.). (*Oil & Soap*, 22 (1945), No. 9, pp. 238-240, illus. 1).—Clearly defined inflections were shown to characterize the solidification point diagram of binary mixtures of caprylic and capric acids. These diagrams are presented, together with pertinent data and a description of attested procedure for preparing the acids from readily available raw material.

Polyamides from polymeric fat acids, L. B. FALKENBURG, H. M. TEETER, P. S. SKELL, and J. C. COWAN. (U. S. D. A.). (*Oil & Soap*, 22 (1945), No. 6, pp. 143-148, illus. 1).—The preparation and properties of various polyamides, copolyamides, and modified polyamides of polymeric fat acids are described. These polymers are shown to be of interest because of their unusual properties and because of the unsaturation and relatively high molecular weight

of the polybasic acids involved. Despite the presence of tribasic acids in polymeric fat acids, ungelled polymers having molecular weights of 3,000 to 5,000 are obtainable. The application of theoretical principles of polymerization to the preparation of these polymers is briefly discussed. Possible industrial uses for the polyamides are indicated.

Allylic esters of polymeric fat acids, H. M. TEETER and J. C. COWAN. (U. S. D. A.). (*Oil & Soap*, 22 (1945), No. 7, pp. 177-180, illus. 2).—Allyl, β -methallyl, and β -chlorallyl esters were prepared from polymeric soybean fat acids by direct esterification and from dilinoleic acid by transesterification of methyl dilinoleate. The method of polymerizing the esters and the properties of the polymers are described. The properties observed were considered to indicate the possibility of the use of these polymers as modifiers and softening agents in the production of various other polymers, as tackifiers and softening agents for elastomers, and as components of surface coatings for special purposes.

Oxygen absorption of methyl esters of fat acids, and the effect of antioxidants, A. J. STIRTON, J. TURER, and R. W. RIEMENSCHNEIDER. (U. S. D. A.). (*Oil & Soap*, 22 (1945), No. 4, pp. 81-83, illus. 2).—The oxygen absorption of methyl linolenate, methyl linoleate, methyl oleate, methyl stearate, the distilled methyl esters of lard, and various mixtures of the four individual methyl esters were measured at 100°C. in the Barcroft-Warburg apparatus. Mixtures of methyl esters absorbed oxygen at a rate which could be approximately predicted from the rate of oxygen absorption of each component and the percentage of each present. The antioxidants nordihydroguaiaretic acid, propyl gallate, benzylhydroquinone, α -tocopherol, and their synergistic combinations with citric acid, *d*-isoascorbyl palmitate, and lecithin were tested with the substrates methyl linoleate, methyl oleate, methyl stearate, and the distilled methyl esters of lard. Citric acid showed marked synergism with each antioxidant. The two most effective were the combinations of citric acid with nordihydroguaiaretic acid and with propyl gallate.

The synthesis and properties of the acyl phosphates of some higher fatty acids, A. L. LEHNINGER (*Jour. Biol. Chem.*, 162 (1946), No. 2, pp. 333-342).—Monopalmitylphosphoric acid and monooctanoylphosphoric acid (mixed anhydrides of phosphoric acid and the fatty acid) were synthesized by the reaction of the proper acyl chloride with monosilver phosphate. It is pointed out that the methods developed could be used in the synthesis of other higher fatty acid phosphates. Silver, calcium, barium, and strychnine salts of these compounds were obtained. The introduction of the phosphate group into the fatty acid molecule gave it the properties of a much more soluble, more hydrophilic substance. The compounds were relatively unstable in aqueous solution, but showed themselves to be more stable than either acetyl phosphate or 1,3-diphosphoglyceric acid. It was found that the phosphatases present in mammalian tissues quickly hydrolyze the fatty acid phosphates, and that the adenylic acid system is not an obligatory phosphate acceptor in the dephosphorylation of the fatty acid phosphates.

Oxidation of acetyl phosphate and other substrates by *Micrococcus lysodeikticus*, M. F. UTTER, L. O. KRAMPTZ, and C. H. WERKMAN. (Iowa State Col.). (*Arch. Biochem.*, 9 (1946), No. 2, pp. 285-300, illus. 1).—Addition of NaCl to lysed preparations of *M. lysodeikticus* greatly increased respiration on several substrates and permitted oxidation of substances which were otherwise not utilized by lysed cells. Lysed cells in the presence of NaCl were able to metabolize acetyl phosphate. Phosphate was transferred from acetyl phosphate to adenylic acid and there was an increased rate of O_2 -uptake and

an accompanying decrease in volatile acid. Comparison of the range of NaCl concentrations at which acetate and acetyl phosphate oxidation were stimulated suggested an oxidation path for acetyl phosphate which did not involve acetate as an intermediate. A discussion of the possible routes for the oxidation of acetyl phosphate is presented.

The component fatty acids of soybean lecithin, M. H. THORNTON, C. S. JOHNSON, and M. A. EWAN. (Ind. Expt. Sta.). (*Oil & Soap*, 21 (1944), No. 3, pp. 85-87).—Lecithin was prepared from crude soybean phosphatides by a form of the cadmium chloride method. Results of analysis indicated that of this preparation 97 percent was lecithin and 3 percent cephalin. Its fatty acid composition was as follows: Palmitic—15.77 percent, stearic—6.30 percent, oleic—12.98 percent, linoleic—62.92 percent, and linolenic—2.02 percent.

Foaming properties of soap solutions, R. C. MERRILL, JR., and F. T. MOFFETT. (U. S. D. A.) (*Oil & Soap*, 21 (1944), No. 6, pp. 170-175, illus. 3).—Results of tests of the stability of foams prepared from solutions of soaps and detergents by a "liquid drainage" method and a modified "foam time" method were qualitatively equivalent. Rates of drainage of liquid from soap and detergent foams were not proportional to the volumes of liquid in the foam. The stabilities of foams from 0.1 percent solutions of soaps of most of the natural fats and oils tested were much greater than those of foams from single soaps that were sufficiently soluble to form solutions of this concentration. The foam time of a mixture of equal volumes of two 0.1 percent solutions was not equal to the average of the foam times of the separate solutions. A number of electrolytes, organic liquids, pectic materials, and vegetable gums greatly increased foam stability. Data on 0.03 percent sodium tallow and palm-oil soap solutions indicated a maximum foam time at a pH of about 10.6. Increasing the concentrations of 10 soaps from 0.05 to 0.1 percent more than doubled the foam time.

The antioxidant properties of nordihydroguaiaretic acid, W. O. LUNDBERG, H. O. HALVORSON, and G. O. BURR. (*Oil & Soap*, 21 (1944), No. 2, pp. 33-35, illus. 4).—The authors report upon the antioxidant properties of nordihydroguaiaretic acid. This substance is described as readily obtained in substantial yields from a common plant (*Larrea divaricata*) and comparing favorably with other highly effective inhibitors of the phenolic type. It was found more soluble in fats than hydroquinone but not as soluble as the tocopherols. Within the limits of these experiments, and at optimal concentration, it appeared to have no deleterious effects on the qualities of lards. Its effectiveness in stabilizing fats was to some extent carried over into baked products. Ascorbic acid enhances its effectiveness.

Effect of antioxidants, individually and in combination, on stability of carotene in cottonseed oil, K. T. WILLIAMS, E. BICKOFF, and B. LOWRIMORE. (U. S. D. A.). (*Oil & Soap*, 21 (1944), No. 6, pp. 161-164, illus. 3).—By an accelerated test, *l*-ascorbyl palmitate, alpha-tocopherol, hydroquinone, and phospholipids from cottonseed and soybean oil were evaluated singly and in combinations for their antioxidant effect on carotene in mineral oil and cottonseed oil solutions. Their effects in retarding the formation of peroxides in the refined cottonseed oil were also determined, and similar studies were made on cottonseed oil after the addition of 1.2 mg. of carotene per gram of oil. In the refined cottonseed oil the formation of peroxides occurred concurrently with the destruction of carotene and was greatly accelerated as the carotene disappeared. In mineral oil solutions, no peroxides were found until after the carotene had become completely decolorized. Although

alpha-tocopherol was very effective in stabilizing carotene when added to mineral oil solutions, neither the naturally present nor added tocopherol was effective in a more unstable solvent such as refined cottonseed oil. To make the tocopherol effective in such a solvent it was necessary first to stabilize the solvent. When the combination of phospholipid and hydroquinone was added to the refined cottonseed oil, the oil was stabilized and a very marked increase in carotene stability was obtained.

Stabilization of carotene with nordihydroguaiaretic acid and other antioxidants, E. BICKOFF, K. T. WILLIAMS, and M. SPARKS. (U. S. D. A.). (*Oil & Soap*, 22 (1945), No. 5, pp. 128-131, illus. 1).—Relative values for the carotene-stabilizing effects in edible oil solutions of a number of antioxidants, alone and in various combinations, were determined. One of the more promising for this purpose was nordihydroguaiaretic acid. When this antioxidant was used together with phospholipid or citric acid, its effectiveness was enhanced. Addition of α -tocopherol to oils containing only traces of this antioxidant caused a significant increase in carotene stability. Its sparing effect on carotene in vivo would further add to the desirability of its use in such oil solutions of carotene. In refined cottonseed oil, carotene destruction occurred concurrently with the accumulation of peroxides. In the more saturated oils, carotene destruction occurred before much peroxide was detected in the oils.

Identity of some electro-dialyzable constituents of cotton root bark, D. R. EGGLE, L. E. HESSLER, and J. E. ADAMS. (U. S. D. A.) (*Jour. Amer. Chem. Soc.*, 68 (1946), No. 1, pp. 48-49).—The authors report upon a "systematic attempt," with reference to the relation of the chemical composition of the cotton root to the incidence of phymatotrichum root rot, to isolate quantitatively and to identify "definite organic compounds, principally nitrogenous, from the dialyzates of cotton root bark." Electro-dialysis was used to separate the nitrogen that was subsequently determined as ammonia, amide, amino, and basic nitrogen. Although the experiments "were not completed with respect to determining the relationship to root rot resistance of these organic constituents," arginine, asparagine, betaine, and oxalic acid were isolated in significant quantities from the electro-dialyzates of extracts from cotton root bark. Approximately half of the total organic nitrogen content of the catholyte was accounted for as definite compounds of which asparagine was predominant.

Norelac—a proposed new synthetic coating material, J. C. COWAN, A. J. LEWIS, and L. B. FALKENBURG. (U. S. D. A.). (*Oil & Soap*, 21 (1944), No. 4, pp. 101-107, illus. 4).—A new protective coating material, Norelac (NORthern REgional LACquer), the ethylene diamine polyamide of polymeric fat acids, is described. A preliminary report on its properties indicates that it may prove to be a superior protective coating for wood, metal, and other materials, and an adhesive for heat-sealing and laminating of paper, cellophane, glassine, and other packaging materials. The solubility characteristics of Norelac show that solvation probably occurs in compounds containing electron-acceptor groups, such as alcohols, amines, acids, and chloroform.

Bromine analogs of DDT, S. J. CRISTOL and H. L. HALLER. (U. S. D. A.). (*Jour. Amer. Chem. Soc.*, 68 (1946), No. 1, pp. 140-141).—The authors here report upon the preparation of 1-tribromo-2,2-bis(4-chlorophenyl)-ethane and of 1-tribromo-2,2-bis-(4-bromophenyl)-ethane. These compounds were obtained, although in poor yields, by condensing bromal with chlorobenzene and with bromobenzene, respectively, in reactions catalyzed by sulfuric acid.

The first of these analogs was found fairly stable. It could be recrystallized from 95 percent ethanol, and melted, when pure, at 146°–147°C. The second (pentabromo-) analog proved very unstable. It melted at 173°–174° when pure. Dinitro derivatives of both of these DDT analogs were prepared.

Stability of DDT and related compounds, E. E. FLECK and H. L. HALLER. (U. S. D. A.). (*Jour. Amer. Chem. Soc.*, 68 (1946), No. 1, pp. 142–143).—Despite the recognized actions of iron chromium, ferric and aluminum chlorides, etc., in catalyzing a reaction resulting in the loss of hydrogen chloride from the DDT molecule and of certain solvents tending to inhibit this catalytic decomposition, the authors find to be prevalent a belief that pure 1,1,1-trichloro-2,2-bis-(4-chlorophenyl)-ethane is less heat stable than is technical DDT.

Experimentally, they found that a technical DDT sample having a setting point of 91.4°C. could be heated in chemically clean glass dried at 110° for 4 hr. at from 115° to 120° with the loss of only 0.02 mole of hydrogen chloride. Twice recrystallized from alcohol, air-dried, and handled with stainless steel spatulas, this material melted at 108°–109°, but lost 0.45 mole of HCl on being heated as above specified. Again purified, but handled with a nickel spatula and dried in a vacuum at room temperature, the preparation had the same melting point (108°–109°) but lost no HCl when heated for 4 hr. at 115°–120° as above specified. It is concluded that small traces of catalytic substances are readily taken in the handling of the pure compound with iron or stainless steel instruments. "While it is probable that catalytic materials may exist in the technical grade, other impurities such as polymers of chloral and 2-trichloro-1-*p*-chlorophenylethanol inhibit their action to a certain extent. When these inhibitors are removed without taking safeguards against removal of catalytic substances, an apparent instability of DDT is produced." Further experiments showed a marked catalytic action of 0.01 percent of ferric chloride, causing somewhat larger losses of HCl from pure than from crude DDT.

Electrokinetics.—XXVI, The electroviscous effect, III, in β -lactoglobulin systems: An interpretation of the meaning of $K\phi$ values obtained from electroviscosity data, D. R. BRIGGS and M. HANIG. (Minn. Expt. Sta.). (*Jour. Phys. Chem.*, 48 (1944), No. 1, pp. 1–12, illus. 1).—Tested quantitatively by means of the data obtained in the first two studies of this subseries (E. S. R., 86, p. 724), the Krasny-Ergen theoretical equation for the electroviscosity effect was found not to describe the observed phenomena accurately. The equation was so modified as to express correctly the experimentally measured relationship between the viscometrically effective volume and the unsolvated volume of the dispersed phase of colloid electrolyte, to illustrate the dependence of the equation upon the particular colloid electrolyte system to which it is applied, and to eliminate the conversion of the experimental terms of the equation E. S. U. Experimental data for the electrokinetic potentials (ζ), the specific conductivities (λ), and the viscosity increments ($\eta_s - \eta_0$) of the systems β -lactoglobulin-sodium chloride and sodium gum arabate-sodium chloride were applied to the modified equation.

It was found for β -lactoglobulin, as the salt content was increased with an ion common to the gegenion, that the entire change in viscosity is due to the electroviscosity effect and that this change is independent of the pH of the solution and of increased salt concentrations to higher ionic strengths. Under these conditions, therefore, the values for the degree of hydration, or of asymmetry, for the protein in aqueous solution, as calculated from the values of $K\phi/C$, agree with those calculated from viscosity, diffusion, and

ultracentrifugal measurements at high salt concentrations. For the system sodium gum arabate-sodium chloride, it was found that as the ionic strength was increased above 0.01, the straight line of the plot of $1/\eta_{sp}$ against

$\frac{m^2}{\lambda(\eta_0 - \eta_\infty)}$ departs from linearity, the rise in the curve being interpreted as

a decrease in the viscometrically effective volume of the colloid. The $K\phi/C$ value for the two systems β -lactoglobulin and sodium gum arabate are compared. Those for β -lactoglobulin were found to be constant throughout the range of ionic strengths, protein concentration, and pH employed; those for sodium gum arabate were found to decrease with high ionic strengths. A theory to explain the differences between these two systems as representative of two distinct classes of colloids is proposed.

" β -Lactoglobulin is pictured as a strong, internally well knit micelle, incapable of changing either in size, or shape, under the relatively weak, osmotic forces of its gegenions; sodium gum arabate is pictured as an internally weakly knit colloid, fully capable of undergoing large changes in size, or shape, under the relatively weak osmotic influence of its gegenions."

The uses and limitations of membrane electrodes, C. E. MARSHALL. (Mo. Expt. Sta.). (*Jour. Phys. Chem.*, 48 (1944), No. 2, pp. 67-75, illus. 1).—"An examination of assumptions made and errors encountered in the use of membrane electrodes leads to the conclusion that single cationic activities are determined with an uncertainty not exceeding 4 percent at ionic strengths around $M/10$ and 2 percent at and below $M/100$."

The special characteristics of clay membranes prepared by preheating films of montmorillonite and beidellite are described. By determining the mobility ratio of two cations within a given membrane, mixtures may be analyzed. Such determinations are facilitated by the use of membranes sensitive to monovalent but not to divalent cations.

Electron micrographs of crystalline plant viruses, W. C. PRICE, R. C. WILLIAMS, and R. W. G. WYCKOFF. (*Arch. Biochem.*, 9 (1946), No. 2, pp. 175-185, illus. 8).—"Air-dried films of the diluted virus suspension on the usual collodion-covered metal screens were subjected to a high-vacuum gold evaporation deposit, the filament so placed that objects on the collodion substrate shielded areas about five times their height from the depositing gold; the weight of gold was chosen so that its average calculated thickness over the surface of the preparation was 8 a. u. The resulting shadowed electron micrographs show that the elementary particles of the tomato bushy stunt and of the southern bean mosaic viruses are essentially spherical bodies of about the same size. The measured diameter of the bushy stunt particle on these photographs is 255 a. u. The micrographs also provide evidence of the regular way in which the particles arrange themselves when forming crystalline aggregates.

A modified Kreis test suitable for photocolorimetry, M. F. POOL and A. N. PRATER. (U. S. D. A.) (*Oil & Soap*, 22 (1945), No. 9, pp. 215-216).—"A form of the Kreis test described as sensitive, convenient, rapid, and yielding reproducible results was developed for a single-phase reaction system suitable for direct photometric measurement.

The acid reagent consisting of trichloroacetic acid diluted with amyl acetate proved to be unstable and unpleasant to use, and to produce large and variable blank values which could not be reduced by purification of the reagents. It was found, however, that the color could be developed equally well in glacial acetic acid solution of trichloroacetic acid containing enough chloroform to dissolve the fat. A sample of the fat weighing 1.5 gm. or less

is introduced into an 18- by 250-mm. test tube and diluted to 5.0 cc. with chloroform. To this mixture, 5.0 cc. of a solution of 150 gm. of trichloroacetic acid in 500 cc. of glacial acetic acid and 1.0 cc. of a solution of 1.0 gm. of phloroglucinol in 100 cc. of glacial acetic acid are added. The resultant mixture is stirred by a bubbling stream of air for 2 or 3 sec. The test tube is then placed in a water bath at 45°C. After exactly 15 min., the tube is removed and 4 cc. of 95-percent alcohol is added. The photometric measurement is made on this solution within a few minutes. The comparison solution for adjustment of the colorimeter is prepared like the test solution with the exceptions that the phloroglucinol is omitted and 1 cc. of glacial acetic acid is used. The colorimeter should be equipped with a yellow-green filter, preferably having its maximum transmission near 545 m μ .

Sampling soybeans for analysis, O. A. KROBER, F. I. COLLINS, and M. J. DEMLOW. (U. S. D. A. coop. 24 expt. stas.). (*Oil & Soap*, 22 (1945), No. 8, pp. 194-196, illus. 4).—Under the conditions of this study, 30-gm. samplings of mixtures of soybeans were found to differ significantly in oil and nitrogen content, indicating the desirability of larger samples. The use of 120- to 240-gm. aliquots from mixtures of soybeans which vary widely in chemical composition is suggested as likely to reduce differences due to sampling to a reasonable minimum. Differences among 30-gm. samplings of highly uniform soybean seed of a single variety appeared to be of slight significance. It is emphasized that the limitations of present sampling methods should be recognized in any comparison or interpretation of chemical analyses of soybean seed.

Effect of relative humidity on the determination of oil in soybeans, O. A. KROBER and F. I. COLLINS. (U. S. D. A. coop. 12 expt. stas.). (*Oil & Soap*, 21 (1944), No. 1, pp. 1-5, illus. 5).—Experiments upon the petroleum spirit extraction of samples adjusted to various moisture percentages in atmospheres of three different ranges of relative humidity led to the conclusion that the percentage of extractable material which is obtained is highly dependent upon the atmospheric conditions under which the sample is analyzed. When soybean meals with moisture content from 4.35 to 16.8 percent were analyzed for oil content at 75-80 percent relative humidity, the percentage of extractable material was not dependent upon the original moisture level. At lower moisture percentages or in lower ranges of relative humidity, this independence was not observed, however. Under conditions of relatively high humidity with meals of high moisture content, the short (2-hr.) extraction gave results which checked satisfactorily with the results obtained by the official 4-hr. method under like conditions. The data emphasize the fact that the determination of oil in soybeans was empirical, and that any analysis did not necessarily represent the total lipides present in the sample. The data are held to have shown the necessity of control of moisture conditions under which seed is stored and under which it is analyzed if reproducible results are to be obtained.

Micromethod for the determination of urea, V. E. KINSEY and P. ROBISON (*Jour. Biol. Chem.*, 162 (1946), No. 2, pp. 325-331, illus. 3).—A micromethod of estimating urea in plasma or other body fluids in quantities as small as 4 mm.³ containing 1 γ of urea, with an accuracy of ± 5 percent, consists in direct conversion of urea into ammonia by means of urease, distillation into a hanging drop of glycerol containing boric acid, and titration with dilute acid or, alternatively, with a colorimetric procedure in place of the acid titration. Average recoveries of urea from 0.01 to 0.02 cc. of plasma or aqueous humor were 97.8 percent with a variation from 94 to 101 percent.

The quantity of urea in rabbit plasma and aqueous humor averaged 306 γ and 270 γ per cubic centimeter of water, respectively, with an average ratio of 0.88.

Detection and estimation of steam-distilled wood turpentine in gum spirits of turpentine, S. R. SNIDER. (U. S. D. A.). (*Indus. and Engin. Chem., Analyt. Ed.*, 17 (1945), No. 2, pp. 107-109).—It is noted that steam-distilled turpentine has been used as an adulterant for the gum spirit, and that, of the four types of turpentine (gum spirit, steam-distilled wood, sulfate wood, and destructively distilled wood turpentine) only the steam-distilled wood product has been found to contain benzaldehyde. It is proposed to oxidize the aldehyde to benzoic acid and to nitrate under carefully specified conditions leading to the formation of 3,5-dinitrobenzoic acid, the reduction of which by hydroxylamine in ammonia solution to the 3,5-diamino acid (the ammonium salt of which gives a characteristic red color to the solution in which it is formed), completes the test. A qualitative test and an approximate quantitative determination for steam-distilled wood turpentine in the gum spirit are based upon this color reaction.

Standards in vitamin A assays: U. S. P. reference cod liver oil vs. beta-carotene, E. C. CALLISON and E. ORENT-KEILES. (U. S. D. A.). (*Indus. and Engin. Chem., Analyt. Ed.*, 17 (1945), No. 6, pp. 378-379).—Evidence both from biological and from spectrophotometric data showed that U. S. P. reference cod-liver oil No. 2 contains less than 1,700 International Units of vitamin A per gram, and therefore assays of vitamin A value performed by bioassay using U. S. P. reference cod-liver oil No. 2 as the standard and expressed in terms of International Units may be from 30 to 44 percent higher than the actual value. Data showing the instability of vitamin A as it occurs in U. S. P. reference cod liver oil No. 2 are also presented. Pure β -carotene may be used as a standard for the bioassay of vitamin A until a more stable and satisfactory standard is developed.

Frozen vitamin standards, O. E. STAMBERG and D. W. BOLIN. (Idaho Expt. Sta.) (*Indus. and Engin. Chem., Analyt. Ed.*, 17 (1945), No. 10, p. 673).—Thiamine and riboflavin standards were prepared in 2 percent acetic acid and 5 cc. aliquots were pipetted in 15 cc. vials. These were placed in a refrigerator at -15°C . at a 45° angle for freezing and storage. Using the fluorometric method of assay, comparisons were made with fresh standards, and indicated that the frozen standards stored up to 6 mo. were still satisfactory. The method is recommended as being accurate and time-saving.

A rapid method for the combined determination of thiamine and riboflavin in cereal products, A. HOFFER and A. W. ALCOCK (*Cereal Chem.*, 22 (1945), No. 3, pp. 271-272).—The method of Hoffer et al. (E. S. R., 92, p. 616) has been simplified to permit simultaneous assay of both thiamine and riboflavin. Aliquots of the same extract from a 0.5-gm. sample are used, and the permanganate decolorization step in the riboflavin determination is omitted.

Duplicate 1-gm. and 0.5-gm. samples from 87 enriched flours were tested. Slightly higher results were found with the 0.5-gm. samples (4.68 v. 4.57), but the standard error was smaller.

A simple fluorometric method for thiamin in milk, A. Z. HODSON (*Food Res.*, 10 (1945), No. 4, pp. 351-356).—A simplification in the thiochrome method of Hennessey and Cerecedo (E. S. R., 82, p. 588) is presented for the assay of milk products. Briefly, the milk is digested with takadiastase at pH 4.0 to 4.5 for 3 hr. at 50°C ., diluted with 2 percent tri-chloroacetic acid, and filtered. The filtrate, if reasonably clear, is then treated with the same reagents as in the original method, but without passing through the base-

exchange step. Three aliquots are used—one serving as sample, the second containing 1 mg. added thiamine, and the third serving as the blank.

Recovery of thiamine, added to the original fresh or evaporated milk samples, ranged from 94 to 107 percent. The use of takadiastase was necessary for best results.

The results are in good agreement with duplicates run by microbiological methods.

Simplified colorimetric determination of thiamine in cereal products, M. HOCHBERG, D. MELNICK, and B. L. OSER. (*Cereal Chem.*, 22 (1945), No. 2, pp. 83-90, illus. 1).—The method previously described by Melnick and Field (E. S. R., 83, p. 11) has been modified for use with cereal products. A 10- to 20-gm. sample is refluxed in 0.05 N H_2SO_4 , cooled, adjusted to pH 4.5, treated with takadiastase, and a clear extract prepared by centrifugation or filtration. A special apparatus is described for the adsorption and elution of the thiamine from a zeolite column. After elution, the concentrated thiamine extract is then treated with diazotized *p*-aminoacetophenone; the red pigment formed is extracted with xylene, and colorimetric comparisons are made with thiamine standards similarly treated. The method is considered applicable to low potency material if it is not rich in protein. Large quantities of adsorbable amino acids interfere with the retention of thiamine on the zeolite column.

Methods for determination of thiamine in blood and tissues with observations on relative contents, L. D. GREENBERG and J. F. RINEHART (*Soc. Expt. Biol. and Med. Proc.*, 59 (1945), No. 1, pp. 9-13).—A simplified procedure is described based on the methods of Friedemann and Kmiecik (E. S. R., 91, p. 638) and Harris and Wang (E. S. R., 87, p. 762). As little as 1 cc. of blood or 0.3 to 1.0 gm. of tissue can be used.

In general, the sample is heated with 5 percent metaphosphoric acid, cooled, adjusted to pH 4.5, and centrifuged. The supernatant fluid is incubated with takadiastase, the extract absorbed on Decalco, and the usual thiochrome procedure carried out. Experiments on thiamine-deficient and control rats have shown that the thiamine concentration in the blood parallels that in the tissue, and that both reflect the thiamine intake.

Note on Antonoff's so-called rule, H. L. CUPPLES. (U. S. D. A.). (*Jour. Phys. Chem.*, 48 (1944), No. 2, pp. 75-76).—The author points out sources of error in a recent discussion of this subject.

Wax pencils for writing on cold wet glassware, J. E. LOVELOCK (*Nature [London]*, 155 (1945), No. 3941, p. 581).—Pencils which will write satisfactorily on cold glass covered with a moisture film can be made by adding from 5 to 10 percent of "a detergent, preferably cationic," to the wax mixture. Of "many possible formulae," the following is recommended as easily made up: Paraffin wax, m. p. 65°C., 100 gm.; beeswax, 20 gm.; vaseline, 20 gm.; cetyltrimethylammonium bromide, 10 gm.; a fat-soluble dye (e. g., Sudan III), 0.5 to 1 gm.; and 20 gm. of titanium dioxide or other white pigment, to be stirred in after the waxes have been melted together and the dye and "detergent" [wetting agent?] dissolved. The author completed his pencils by casting the mixture in the form of sticks about 6 in. long by 1/8 in. in diameter and wrapping these with paper.

Stability values obtained by different rapid methods as a means of evaluating antioxidants for fats and oils, R. W. RIEMENSCHNEIDER, F. E. LUDDY, S. F. HERB, and J. TURER. (U. S. D. A.). (*Oil & Soap*, 22 (1945), No. 7, pp. 174-177).—The authors compared stability values and protection factors as determined by three widely used rapid methods, the active-oxygen,

oxygen-absorption, and the oven-test methods. In most instances there was fair agreement between the results by the active-oxygen and oxygen-absorption methods, as indicated by protection factors. In general, use of dry air instead of moist air in the active-oxygen method resulted in little significant difference in the stability values, although in some preparations differences which may be significant were observed. Use of dry oxygen in the active-oxygen method gave results comparable with those obtained by the oxygen-absorption method. In experiments in which an oven test was also used, the protection factors in most cases were in general agreement with those obtained by the other two methods. The synergistic antioxidant effect of acidic compounds with phenolic antioxidants was most pronounced with lard of low stability. Likewise, the protection factors were disproportionately greater when antioxidants were added to lard of low stability than when these compounds were added to lard of good stability. The results indicated that comparison of antioxidants by means of protection factors is valid only when the same substrate is used. Protection factors so obtained were found to help in the evaluation of the order of effectiveness of various antioxidants, but not to yield a strict quantitative comparison of the protective power of the antioxidants when applied to other substrates.

Modified thiocyanogen reagent and method, M. G. LAMBOU and F. G. DOLLEAR. (U. S. D. A.). (*Oil & Soap*, 22 (1945), No. 9, pp. 226-232, illus. 2).—The authors report upon a general reagent applicable to a wide range of thiocyanogen values and capable of reacting with practically all types of fats and oils. Modifications include rigorous purification of all reagents; replacement of 25 percent of the volume of glacial acetic acid normally used in preparing the thiocyanogen reagent with an equal volume of carbon tetrachloride; use of finely powdered, dry potassium iodide; increase in the quantity of potassium iodide added prior to titration from 1.0 gm. to twice the equivalent weight calculated for the volume of standard reagent used; and complete exclusion of water from all reagents and glassware. Data indicating the stability, accuracy of determination of pure unsaturated acids, and the general applicability of the reagent are given.

Determination of the saturation water content of protein plastics, E. F. MELLON. (U. S. D. A.). (*Indus. and Engin. Chem., Analyt. Ed.*, 17 (1945), No. 11, pp. 743, illus. 1).—The A. S. T. M. standard disk, 0.125-in. thick and 2 in. in diameter, did not reach saturation after several weeks of immersion in water. Disks of one-half the standard thickness approached an equilibrium moisture content during both water absorption and drying much more rapidly than did disks of the standard thickness. Both absorption and drying became essentially asymptotic with approach to completion. Numerous experiments led to the conclusion, however, that a value between 95 and 100 percent of the long-period immersion water content of hot-molded protein plastics could be thus measured: "When the gain in weight in a 24-hr. period is less than 20 mg., or less than 10 percent of the gain in weight in the first 24 hr. if the first 24-hr. gain is less than 200 mg., the specimens are removed from the water and dried."

Improvements in the determination of starch in corn and wheat, F. R. EARLE and R. T. MILNER. (U. S. D. A.). (*Cereal Chem.*, 21 (1946), No. 6, pp. 567-575).—Samples of starch, comprising two from corn, two from wheat, and one each from waxy corn, tapioca, and potato, were analyzed for non-starch constituents. The specific rotation $[\alpha]_D$, of all these starches was found to be 203°C. in calcium chloride dispersion, when corrected for the non-

starchy material. Modifications of the polarimetric method for starch in corn and wheat were studied and procedures devised which, for these two grains, gave results agreeing closely with those obtained by the diastase-acid hydrolysis method. These improved polarimetric procedures are described.

Method for the direct determination of diacetyl in tissue and bacterial filtrates, A. G. C. WHITE, L. O. KRAMPITZ, and C. H. WERKMAN. (Iowa State Col.). (*Arch. Biochem.*, 9 (1946), No. 2, pp. 229-234, illus. 2).—The authors have developed a sensitive and fairly rapid method for the determination both of diacetyl and of acetoin, their procedure being based upon the condensation of diacetyl-oxime with urea. They found it possible to determine diacetyl in tissues and in bacterial filtrates directly and without previous distillation. Acetoin was determined by oxidation to diacetyl by ferric chloride in acid solution followed by distillation. The method appeared to be sensitive for diacetyl and acetoin in concentrations at least as low as 25 γ with an accuracy of ± 10 percent.

A modification of the Kneen and Sandstedt methods for the determination of alpha- and beta-amylases in barley malt, W. J. OLSON, R. EVANS, and A. D. DICKSON. (Univ. Wis. and U. S. D. A.). (*Cereal Chem.*, 21 (1944), No. 6, pp. 533-539, illus. 1).—The original method of Sandstedt, Kneen, and Blish (E. S. R., 83, p. 440) for α -amylase was modified to make it more applicable to routine determinations in barley malt laboratories. The dextrinization was measured at 20°C. instead of 30°, and the American Association of Cereal Chemists diastatic power procedure was substituted for the malt saccharifying activity determination of Kneen and Sandstedt (E. S. R., 89, p. 8). The relation between α -amylase saccharifying and α -amylase dextrinizing activity was established under these modified experimental conditions. By the use of the values so obtained, suitable corrections for α -amylase saccharifying activity could be made and a valid measure of β -amylase activity secured. Two methods of preparation of enzymatically pure β -amylase were tested, and a simple method for ascertaining the presence of α -amylase is described.

AGRICULTURAL METEOROLOGY

Relations between solar activity and the lower atmosphere, B. HAURWITZ (*Amer. Geophys. Union Trans.*, 27 (1946), No. 2, pp. 161-163).—The existence of close connections between solar activity and physical processes in the upper atmosphere is well established; whether similar relations exist between solar activity and the state of the lower atmosphere is an open and sometimes hotly debated question. It would seem that if a plausible mechanism were suggested for interaction between the sun and the lower atmosphere, progress in this field would be greatly enhanced. The purpose of this note is to start discussion of the subject and to show what kind of investigations are required to check the hypothesis presented with respect to the effects of solar flares. It is believed that the hypothesis outlined will have some value even if proved untenable by further study, since in that case it is difficult to see how any causal relationship between solar activity and the weather can exist. On the other hand, it is well to remember that the establishment of relations between solar activity and the lower atmosphere on a firm physical basis cannot be expected to bring about a complete solution of the problem of weather forecasting. The solar flares would be only one of the factors influencing the atmosphere and, moreover, the atmosphere will re-

spond differently to the same impulse, depending on its initial state. Nevertheless, considerable progress in understanding atmospheric developments can be expected if one more of the causes of changes therein is found.

Single-radiosonde analysis in local 8-hour forecasting of precipitation, I. I. SCHELL. (*Amer. Met. Soc. Bul.*, 27 (1946), No. 4, pp. 164-168, illus. 2).—A simple and rapid analysis of a radiosonde ascent may indicate to a high degree of probability whether or not precipitation will occur at the station within 8 hr. The procedure consists in determining for each significant point below the 600-mb level the ratio of the mixing ratio to the lift (pressure drop required to bring about condensation), from which ratios is derived a "precipitation index." Since the method is applicable without synoptic charts, it could be of most value for forecasts covering areas near radiosonde ascents made where preparation of charts or their proper use is impractical or delayed. The method is described in detail.

A simple theory of the electric hygrometer, W. SCHAFFER (*Amer. Met. Soc. Bul.*, 27 (1946), No. 4, pp. 147-151, illus. 5).—The electrical resistance hygrometer has assumed great importance to all meteorologists using upper air data based on the American radiosondes. Unfortunately no previous account of the theory of the instrument appears to have been published, though greatly needed to clarify the working of the instrument, its possibilities, and—more particularly—its limitations. This paper attempts to give a simplified theory satisfying these requirements. Besides presenting the theory, the instrument is described, its operation and limitations are discussed, and the effects of temperature are shown.

Anemometer slowage indicators, R. L. IVES (*Amer. Met. Soc. Bul.*, 27 (1946), No. 4, pp. 173-177, illus. 4).—Experience with these and related slowage-indicating devices is said to indicate that those embodying condenser-resistor timers are not suited to use with standard anemometers, though they have proved satisfactory with those having very short contacting intervals, and that those using electric clocks, stepping switches, and similar rugged electromechanical devices are highly satisfactory for continuous operation under favorable environal conditions.

Climatology, A. A. MILLER (London: Methuen & Co., 1946, 4. ed., pp. 325+, illus. 82).—"The object of this book is to provide advanced students, and especially students of geography, with a reasoned account of the world's climatic types."

Climatic divisions of Maine, C. B. FOBES (*Maine Technol. Expt. Sta. Bul.* 40 (1946), pp. 44+, illus. 14).—The multiplicity of weather observations recorded in many different publications gives a particularly good basis for research in climatology; the very nature of the sources of these data and the forms in which they are recorded tend, however, to obscure regional climatic types and inter-regional variations. Until statistical data are spread on maps, thus bringing out areal relationships and differences, geographical significance is at best difficult to deduce. According to J. M. Trefethen in the foreword, the author here "assembles pertinent data and makes their significance readily comprehensible by means of maps and discussions. . . . By the text and accompanying maps, this paper shows what can be expected in the various parts of Maine during the year."

Agricultural climatology in Australia, H. C. TRUMBLE (*Jour. Austral. Inst. Agr. Sci.*, 11 (1945), No. 3, pp. 115-119).—The author reviews the recent developments of agroclimatological methods in relation to an improved understanding of the Australian environment, discussing world classifications of climate, Australia in relation to other regions and climatic indexes developed

there, evaporation from water and the soil, duration of periods relating to growth, climatic variability, and the relationship of climatic indexes to land use and production in Australia. There are 24 references.

Microclimatic differences in minimum temperature and variations in frost injury to hillculture plants, J. M. AIKMAN and G. L. BRACKETT. (*Iowa Expt. Sta. and U. S. D. A.*). (*Iowa Acad. Sci. Proc.*, 51 (1944), pp. 147-156, *illus. 1*).—Of the climatic factors influencing the growth and yield of fruit trees and other hillculture plants in southeastern Iowa—with the possible exception of excessive drying on southwest-facing slopes—the most important is said to be low temperature. Records are presented of the occurrence of definite frost injury to grapes in microclimatic areas much later in spring and earlier in fall than seemed possible from examination of U. S. Weather Bureau records—possible because the weather stations are located in sites giving average over-all climatological records in spite of variations within small areas. It is also shown that even in special studies of microclimatic areas, climatological determinations may be inadequate, and in order to supplement the thermograph data use of minimum thermometers is advised on the basis of experimental tests. The information presented on variations in temperature between two seasons (1942 and 1943) indicated that seasonal variations and their effects on plant growth must be considered in a study of microclimates. The ranking of the sites on a farm on the basis of adequacy of cold air drainage, length of growing season, and other temperature values may easily be done with the use of three to four minimum thermometers. In measuring cold air drainage, the readings should be taken after the cold air has moved in and the cold air drainage down the slope is well established. Comparisons are made of minimum temperatures during winter storm periods at three elevations on a south slope and at the two nearest Weather Bureau stations (1943-44); the results seem to indicate that evaluation of sites on a winter temperature basis for fruit trees, vines, and other woody plants by means of minimum temperature readings would be advisable to prevent possible winterkilling. It would also seem desirable to designate the elevation of the site in making recommendations on the adaptation of plants to different regions or zones. There are 12 references.

Evaporation regions in the United States, S. S. VISHNER (*Sci. Mo.*, 62 (1946), No. 5, pp. 453-457, *illus. 11*).—The rate of evaporation of water is a highly important environmental influence meriting continued study. Several prolonged investigations of local and regional differences in evaporation have been made by biologists; the accompanying 11 maps present some recent data—chiefly by nonbiologists—which supplement earlier studies in significant ways.

Notable local floods of 1939.—I, Floods of September 1939 in Colorado River Basin below Boulder Dam, J. S. GATEWOOD. II, Flood of July 5, 1939, in eastern Kentucky, F. F. SCHRADER. III, Flood of August 21, 1939, in town of Baldwin, Maine, M. R. STACKPOLE (*U. S. Geol. Survey, Water-Supply Papers* 967-A (1945), pp. 39+, *illus. 13*; 967-B (1945), pp. 41-59+, *illus. 11*; 967-C (1946), pp. 61-68+, *illus. 7*).—Of the three floods in widely separated areas noted in these papers, those in Maine and Kentucky were caused by single local storms of brief duration and cloudburst intensity. The Maine storm lasted about 3 hr., covered an area of about 100 sq. miles, had an intense rainfall area (6 in. to more than 12 in.) of about 30 sq. miles, and produced a flood discharge of 340 sec.-ft. per square mile in a brook draining a 4.7-sq.-mile area. The Kentucky storm was of about the same duration, included about 443 sq. mile within the 8-in. isohyetal, and had a maximum

intensity of more than 12 in. Probable rates of flow include a maximum of 2,000 sec.-ft. per square mile or more from an area of from 5 to 10 sq. miles. The Colorado River Basin floods were caused by three successive tropical storms occurring between September 3 and 26, the mean annual precipitation being exceeded at many points by that for September 1939. Flood peaks in Colorado River were greatly reduced by storage. Between September 5 and 20 Lake Mead stored 330,000 acre-ft. of water. Between September 4 and 7 Havasu Lake stored 135,000 acre-ft., and the channel storage between Topock and Yuma, exclusive of Havasu Lake, accounted for about 110,000 acre-ft. at the peak.

Notes on the three cyclones in Mauritius in 1945: Their effect on exotic plantations, indigenous forest, and on some timber buildings, H. C. KING (*Empire Forestry Jour.* [London], 24 (1945), No. 2, pp. 192-195).

SOILS—FERTILIZERS

Some soil properties which influence the use of land in West Virginia, R. M. SMITH, G. G. POHLMAN, and D. R. BROWNING. (Coop. U. S. D. A.). (*West Virginia Sta. Bul.* 321 (1945), pp. 71, illus. 14).—Soil profile samples selected to be typical of the soils mapped in the State were examined, with laboratory determinations of texture, structure, organic matter, pH, buffer curves, exchange capacity, exchangeable bases, and acid-soluble phosphorus. Color was defined by field observation and by comparison with color charts.

Most of the surface soils were loams or silt loams with clay or clay-loam subsoils. Structural profiles are shown for certain groups of series, and the relationship of structure to movement of air and water, to soil erosion, and also to root penetration is pointed out. The distribution of organic matter in the soil profile in a number of series is given, and the effect of climate and past treatment on organic matter content is discussed.

The relationship between pH, percentage of saturation, and total bases in the major series is given. This shows considerable variation within series as well as between series. Within the soil profiles certain series (particularly Hagerstown and Frederick) increase in base content and percentage of saturation, others show little change, and some show increased acidity and decreased saturation with increasing depth. The relationship of this to growth of certain crops is discussed. The relationship between exchange capacity and organic matter and clay content is shown, and a general guide for evaluating this relationship is given.

The available phosphorus content was generally low, but a few subsoil samples showed high contents of acid-soluble phosphorus. These did not seem necessarily to indicate high available phosphorus contents, as some of these soils showed marked responses to phosphate fertilizers. Exchangeable potash values ranged from low to high, with an average of 0.256 milliequivalent of potassium per 100 gm. of soil. Low potash values occurred, especially in highly leached terrace soils, in sandy soils, in the silty limestone soils, and in old ridgetop soils. Surface soils were usually higher in exchangeable potash than subsoils. High potash content was usually associated with high organic matter in the soil or with high clay content, but the reverse was not always true. The relationship of the various factors to land use is discussed.

Management of soils in the Lower Rio Grande Valley, B. S. PICKETT (*Texas Sta. Cir.* 110 (1946), pp. 13).—Conclusions and recommendations based both on local experiments and on observations of successful practice include the following: Light soils, because of their faster percolation rates,

are easier to handle under irrigation than heavy soils. Light soils can be wet to a considerable depth with a normal irrigation, but heavy soils are wet to only a shallow depth. Because of the difference in depth to which water may penetrate in sandy and heavy soils, it is occasionally desirable to irrigate heavy soils much more heavily than is the ordinary practice in order to allow some leaching to remove some of the excess soluble salts. Although light soils can withstand considerably deeper cultivation than heavy soils, it would be better to use shallow cultivation on all soils in orchards. The vegetable farmer or the farm crops farmer will also find shallow cultivation more satisfactory than deep cultivation. There is less damage done by soil cracking than by deep cultivation. Crops on heavy soils respond more slowly to fertilization than crops on light soils. Nitrogen, alone and in combination with phosphorus, was found to be effective for both citrus and vegetables. No response was obtained from applications of potash on Lower Valley soils.

Some improvements in tensiometer design, E. A. COLMAN, W. B. HANA-WALT, and C. R. BURCK. (U. S. D. A. et al.). (*Jour. Amer. Soc. Agron.*, 38 (1946), No. 5, pp. 455-458, illus. 1).—In elaborating an improved tensiometer design, the authors have "drawn liberally upon that of Richards" (E. S. R., 87, p. 186), but have lessened the difficulties and inconveniences involved in the insertion and removal of the porous cup, reduced the fluctuations of the manometer readings caused by the change with temperature of the volume of the water in the column above the cup, and provided for the removal of air trapped in the porous cup.

Easier placement of the instrument in the soil was attained by placing a 1-in., thin-walled brass tube in a 2-in. auger hole, the top of the brass tube about 6 in. below the soil surface and the space about it back-filled for support. Before the tensiometer was lowered into the brass jacket, a steel gad having a conical shape the same as that of the porous cup and mounted on a suitable length of brass pipe was pressed into the soil at the bottom of the tube. The gad was then removed from the brass pipe, the tensiometer unit attached in its place, a rubber stopper fitted about the copper tubing of the tensiometer and into the top of the brass pipe, and the assembly lowered into working position. The part of the auger hole above the brass jacket was then refilled with soil. Two lengths of $\frac{1}{8}$ -in. copper tubing extending from the porous cup to the above-ground part of the apparatus were used. One tube left the uppermost point within the porous cup and was connected to the U-tube above by a short piece of synthetic rubber tubing. The other extended from the bottom of the cup and was connected at its upper end by a longer piece of synthetic tubing. This double-tube construction accomplished two purposes. It provided, first, a minimum volume of water subject to volume changes in response to temperature. Second, it provided a circulating system by which air coming out of solution within the porous cup could be brought to the U-tube and removed from the instrument. Constructional detail is shown in a dimensioned drawing, and the manner of operating the instrument is briefly indicated.

The laws of soil colloidal behavior.—XXIV, Donnan equilibria in soil formation, S. MATTSO and K. G. LARSSON (*Soil Sci.*, 61 (1946), No. 4, pp. 313-330, illus. 4).—This paper continues a series of theoretical and experimental studies (E. S. R., 86, p. 593) begun by Mattson at the New Jersey Experiment Stations. The Donnan equilibrium theory applied to soils led the authors to the following conclusions: (1) Soils having a low cation-exchange capacity; that is soils which are weak acidoids, such as Red earths

and Laterites, should, other things being equal, contain a higher proportion of exchangeable monovalent cations (Na and K as compared to Ca and Mg) than soils having a high exchange capacity. The former soils possess a lower micellar-ion concentration (a more dilute "inside" solution) and should adsorb the monovalent ions relatively better than the latter. (2) The more unsaturated a soil, the greater should be the proportion of exchangeable monovalent cations. The undissociated acidoid does not participate in the Donnan equilibrium. A highly unsaturated soil has, therefore, a greatly reduced micellar-ion concentration and should adsorb the monovalent cations relatively better than the saturated soils. (3) Among the leached soils the proportion of alkali cations should therefore be greatest in the highly unsaturated soils possessing weak acidoid properties, whereas the proportion of the alkaline-earth cations should be greatest in the slightly leached, saturated soils possessing a high exchange capacity.

As experimental evidence supporting the conclusions above stated, the authors cite the observations (1) that kaolin and a Laterite were found to adsorb relatively more of the ammonium ion from solutions of ammonium and calcium chlorides than did bentonite; (2) that the more unsaturated a bentonite becomes, the more it adsorbs of the monovalent ions; and (3) that analytical data from various sources support the conclusions stated.

A critique of estimating soil solution concentration from the electrical conductivity of saturated soils, R. F. REITEMEIER and L. V. WILCOX. (U. S. D. A. coop. 11 western States et al.). (*Soil Sci.*, 61 (1946), No. 4, pp. 281-293, illus. 8).—The variability of the ratio between the conductivity of the saturation extract (K_e) and that of the saturated soil (K_s) was found to be of a magnitude such as to render the soil conductivity unreliable as an index of soil solution concentration. The extract conductivity was better correlated with crop response than was the soil conductivity. It was shown that the $K_e : K_s$ ratio increases with a decrease in saturation percentage and with an increase in extract concentration. These two relationships appeared to account for the greater part of the variation of this ratio. Factors contributing to the inaccuracies of this method were found to include the lack of a cell constant for some soil cups, variations in saturation percentage, variations in soil salinity, and the conductivity of soil minerals. When a reasonable degree of accuracy is desired, the solution should be extracted from the saturated soil and the conductivity of the solution measured.

Relation of soil reaction to toxicity and persistence of some herbicides in greenhouse plots, A. M. HURD-KARRER (*U. S. Dept. Agr., Tech. Bul.* 911 (1946), pp. 31, illus. 9).—Tested under greenhouse conditions and not subjected to leaching, all of the herbicides studied (sodium chlorate, ammonium and sodium thiocyanates, sodium arsenite, ammonium sulfamate, and borax) showed a toxicity toward plants which was maximal in highly acid soils and diminished with rising pH to a minimum value in alkaline soils. Persistence of toxicity was longest in the acid soils with the exception of that of sodium chlorate, most persistent in the limed soils. Sodium and calcium carbonates reduced borax injury similarly. Sodium chlorate and the thiocyanates were most toxic, 5 gm. in 200 lb. of soil generally being lethal or nearly so. Borax toxicity showed no significant change after 36 mo. in the soil. Thiocyanates disappeared from all the plots within 3 mo. and from nonacid ones in half this time or less. Admixture of sulfur markedly increased borax toxicity. Sodium nitrate mixed into chlorate-containing soil reduced the toxicity at all soil reactions tested from pH 4.3 to 7.9. Ammonium sulfate reduced chlorate toxicity as promptly as did nitrates in slightly acid and in alkaline

soils, but in strongly acid soils, below pH 5.0, its effect was delayed. Cyana-mid generally reduced chlorate toxicity fairly promptly in slightly acid and alkaline soils, but it had no effect in the strongly acid plots, even after several months. The reduction of chlorate toxicity by the nitrogen fertilizers, though unmistakable, was not great enough to be significant in a fertile soil. The experimental results were such as to "suggest that the degree to which the various nitrogen fertilizers can inhibit chlorate toxicity depends on their ability to supply nitrogen as nitrate in the particular soil. Comparative effects of these materials at the different soil reactions were in accord with anticipated effects of soil reaction on nitrification."

Dynamics of wind erosion.—VI, *Sorting of soil material by the wind*, W. S. CHEPIL (*Soil Sci.*, 61 (1946), No. 4, pp. 331-340, illus. 2).—This is a continuation of a series previously noted (E. S. R., 95, p. 172).

It is shown that although the wind tends to remove large quantities of fine dust from cultivated fields, the less mobile grains, none of which exceed 2 mm. in diameter, pile up into dunes or remain in a more or less uniform layer in the vicinity of the eroded area. The size distribution of particles contained in the dunes was found to conform to a definite logarithmic relationship first observed in desert sand. For soils deposited in dunes under apparently the same wind force, the actual peak diameter varied from 0.18 mm. for Hatton fine sandy loam to 0.59 mm. for Sceptre clay. The equivalent peak diameter varied only from 0.13 to 0.28 mm., for the same soils. Average drift soils were considerably more sandy than the corresponding cultivated soils, indicating that much of the fine material in the form of silt and clay was blown away. The greatest sorting of the mechanical fractions was on fine sandy loam, the least, if any, on fine clay. Except in Hatton fine sandy loam, the quantity of organic matter and nitrogen was found to be about the same in the drifted as in the corresponding residual soil material.

Losses of nitrous nitrogen from soils on desiccation, M. R. MADHOK and F. UDDIN (*Soil Sci.*, 61 (1946), No. 4, pp. 275-280).—Of four 50-gm. portions of a sieved sandy loam soil two were treated with sodium nitrate equivalent to 5 mg. of nitrogen per 100 gm., the moisture content was adjusted to 10 percent, and the samples were exposed to the sun for 1 day. Determinations of nitrite, nitrate, and ammoniacal nitrogen showed that the greater part of the added nitrate had disappeared from the treated soil during desiccation, and that it had not been converted either into nitrates or into ammonia. In a clay loam to which 10 mg. of nitrogen as nitrate was added, a like experiment showed about 5 percent of the added nitrate to have been oxidized. The work was repeated with the last-named soil and at 90°C., "a temperature at which little bacterial action could take place," and the same loss of nitrogen was observed. The soils used in these and other experiments had a pH value of 8.7. Ammoniacal nitrogen was present only in traces. A sample of the nitrate-treated soil to which 10 mg. of nitrous nitrogen per 100 gm. had been added was found to give off oxides of nitrogen during desiccation in quantities sufficient not only to be detected by a test paper containing Griess' reagent but also in a concentration such that the odor of nitrogen peroxide could be noted. At a temperature of 80°, similar decomposition of nitrite was obtained in purified sand and after partial removal of air (filter pump vacuum). Such losses of nitrite nitrogen were found to take place in some soils having a pH value as high as 10.7. Atmospheric ammonia and carbon dioxide were both found to accelerate the nitrogen loss, as did exchangeable soil hydrogen and, apparently, the catalytic action of some soil component or components not present in the purified sand.

The nitrogen requirement in the utilization of carbonaceous residues in soil, L. A. PINCK, F. E. ALLISON, and V. L. GADDY. (U. S. D. A.). (*Jour. Amer. Soc. Agron.*, 38 (1946), No. 5, pp. 410-420, illus. 2.—This paper records two greenhouse experiments, one carried out during the winter with wheat as indicator, the other during the spring and summer with Sudan grass as the test crop. The work was designed to show (1) the quantity of nitrogen which must be applied to the growing crop to counteract the effect of a unit of carbon applied as straw, and (2) the extent delayed planting following the turning under of straw and nitrogen will decrease or increase the harmful effect of the straw.

It was found necessary to add, under winter greenhouse conditions, enough nitrogen to make the carbon : nitrogen ratio of a straw-urea mixture about 35 in order to avoid injury by the straw, this addition being equivalent to a nitrogen content of 1.2 percent of the dry organic matter. Under spring and summer conditions, the corresponding values were 27 to 31 for the carbon : nitrogen ratio and 1.56 to 1.37 for the nitrogen percentage. There was no evidence of any injury due to straw other than its effect on nitrogen availability. Additions of nitrogen above that required to meet the needs of the soil flora produced essentially a linear effect on the total nitrogen content of the harvested crops; the increase in yields of dry matter, however, decreased with successive increments of added nitrogen. A 6 weeks' delay in the planting of the crop resulted in a slightly lower recovery of the added nitrogen, but essentially none of this effect could be attributed to the straw. The residual crops of Sudan grass removed only small quantities of nitrogen, even though the highest percentages of the added nitrogen removed by the first crop in the two experiments were only 47 and 55, respectively.

The experiments are held to indicate that by using adequate quantities of commercial nitrogen, undecomposed carbonaceous crop residues can be utilized advantageously for soil organic matter maintenance without injury to crops.

Variance in the carbonatation of certain "glassy" and crystalline calcium silicate materials in soils, W. H. MACINTIRE, S. H. WINTERBERG, H. W. DUNHAM, and L. B. CLEMENTS. (Tenn. Expt. Sta. et al.). (*Soil Sci.*, 61 (1946), No. 4, pp. 295-311, illus. 1).—The reactivity in soils of the relatively new glassy (quenched) calcium silicate slag from electrical phosphate reduction, as distinct from that of the crystalline silicate, was investigated.

Nearly all of the Ca of a 5-ton incorporation of quenched slag was sorbed by a Montevallo silt loam, without appreciable accumulation of CaCO_3 during the growth of nine successive crops. With increase in rate and with decrease in particle size, substantial accumulations of carbonate came from heavier incorporations and from the fines of quenched slag; but, invariably the accumulations were less than the residues of limestone in the controls. At a 39-ton rate, neither wollastonite nor its calcines underwent conversion to carbonate in cropped Hartsells fine sandy loam, whereas corresponding incorporation of quenched slag caused a 15-ton gain in CaCO_3 . Substantial and proportional accumulations of CaCO_3 came from three quenched slags, under three crops, in two soils that were slagged at rates beyond sorptive capacity, the carbonatation having occurred chiefly during the growth of the initial crop, whereas no increase in carbonate content came from the parallel incorporations of wollastonite. The accumulations of CaCO_3 from quenched glassy slag were far more extensive than those from crystalline slag, under five successive crops in each of two soils. A similar disparity in carbonate accumulations was shown by the quenched and unquenched portions of a

laboratory melt of wollastonite. Carbonate accumulations from incorporations of a quenched experimental slag that contained the calcium fluoride complex ($\text{CaO-Al}_2\text{O}_3\text{-F}_2\text{O}_3\text{-SiO}_2\text{-CaF}_2$) were twice as great as the accumulations from incorporations of a slag devoid of that fluoride.

The processes responsible for the silicate transitions are discussed, in accounting for the disparate reactivities of the glassy and crystalline forms in the soils. "When the foregoing observations are integrated with the results obtained when slagged soils were aerated with normal air and with CO_2 -free atmosphere, it appears that the CO_2 of the carbonate accumulations in the slagged soils is attributable to bacterial activations in the soil rather than to influent atmosphere."

Soil studies for 1945: Nebraska outstate crops and soils tests, J. W. FITTS, J. R. MCHENRY, and W. H. ALLAWAY (*Nebraska Sta. Bul. 382 (1946), pp. 22, illus. 4*).—Of experiments on varicous crops and fertilizers, the following are a part of the numerous results recorded:

Nitrogen fertilizers increased the yield of corn significantly in six of the eight tests on irrigated land and in three of the eight tests on nonirrigated land. Uniformity and thickness of stand greatly influenced the results obtained from application of fertilizers. In general, increases in yield from the use of fertilizers were obtained only where the plants were spaced on an average of 20 in. or less in rows 40 in. apart. Ammonium nitrate applied at the last cultivation was more effective than when applied at the time of planting. In all the tests a 40-lb. rate of nitrogen application gave the largest increase per unit of fertilizer added. However, in several tests an 80-lb. rate increased the yield sufficiently over the 40-lb. rate to make such an application profitable.

Phosphorus and potassium fertilizers did not increase the yield of corn significantly in any of the tests. In a test in an irrigated area, sweetclover plowed under when 12 in. tall, 10 tons of manure, and ammonium nitrate applied at the last cultivation, increased the yield of corn markedly over untreated plots. The largest increases were obtained on the corn growing on the sweetclover ground and the corn which received an application of 80 lb. of nitrogen.

Nitrogen was found to be the most effective fertilizer in increasing the yield of forage of brome grass, western wheatgrass, blue grama, and big bluestem. Nitrogen, phosphorus, and potash when applied in combination increased the yield and protein content of forage produced on native wet-hay meadows, but the increase was not sufficiently large to be profitable.

In irrigation experiments, the relative rates and depths of moisture penetration were found to be influenced greatly by small differences in the slope of the irrigation furrow. The rate of entry and depth of penetration of the added irrigation water was greater on the alfalfa and brome grass fields than on adjacent cornfields. No correlation between the distance from the field lateral and the intake of water into the soil was observed. The data indicated that the rate of entry and the depth of penetration of water generally decrease with successive irrigations.

Chemical composition of hay and forage crops as affected by various soil treatments, H. J. SNIDER (*Illinois Sta. Bul. 518 (1946), pp. 259-292 +, illus. 1*).—In protein and mineral content, alfalfa had a feeding value higher than that of any other important Illinois hay crop. The protein content of alfalfa hay did not change with soil productivity levels, and only slightly from one cutting to another through the season. Red clover hay averaged slightly lower than alfalfa in nitrogen, protein, and minerals. Various soil

treatments increased the yields of red clover hay and on some soils increased the amount of protein in the hay. When phosphorus was included in the treatment the hay generally had a higher phosphorus content. Korean lespedeza averaged considerably lower than alfalfa in nitrogen and minerals and was somewhat lower in these constituents than were most of the other legumes. It was especially low in calcium and magnesium. Lespedeza responded to various soil treatments with larger yields of hay and with higher percentages of phosphorus and potassium when these elements were included in the soil treatment.

Alfalfa at the hay stage was superior to soybeans in pounds of nitrogen an acre. Of the four crops compared—alfalfa, sweetclover, lespedeza, and soybeans—sweetclover in the spring yielded the least dry matter to the acre. Among the nonlegumes, Kentucky bluegrass and brome grass had the highest feeding values as judged by protein and mineral content. Both grasses responded to various soil treatments with larger yields of dry matter and usually with a higher content of nitrogen, phosphorus, and potassium, depending on the nature of the treatment. Redtop was slightly higher in protein than either timothy or orchard grass, although there was not a great difference in the average composition of the three grasses at hay stage. All three grasses responded to soil treatment by producing larger yields and yields with higher percentages of the elements considered in this study. Brome grass appeared to give larger response in nitrogen content when grown in association with legumes. All the grasses, however, responded to legume association. Cornstalks—including the main stalk, blades, sheath, and husk—had very low percentages of protein and phosphorus. They had a slightly higher content of calcium and magnesium than had the other nonlegumes. The chemical composition was increased by various soil treatments, but even under the best treatment the feeding quality of cornstalks was low.

In general, the percentages of phosphorus and potassium in both the legumes and the nonlegumes varied with the amounts of these elements available in the soils. When phosphorus and potassium were applied to the land, there was as a rule an increase of each element in the hay. The calcium and magnesium content of legume hays was relatively high, and the amounts of these two elements were rather closely related to the potassium content of the hay.

Values of the legumes as plow-under crops for soil improvement on the light and the dark Illinois soils are briefly noted. It was further found that a number of soils in Illinois produce legume and nonlegume hay and forage that contain less than 3 lb. of phosphorus per ton of dry weight. Three lb. is considered the least amount that will make these hays nutritionally safe for livestock feeding.

Prewar world production and consumption of plant foods in fertilizers, K. G. CLARK and M. S. SHERMAN (*U. S. Dept. Agr., Misc. Pub. 593 (1946), pp. 56 +, illus. 8*).—Brief introductory statements call attention to the importance of collected information concerning prewar world production of the three major plant foods and of phosphate rock for the solution of supply and requirement problems in areas needing postwar relief and rehabilitation, note sources of information, and give general statements concerning the plant food content of fertilizers. The major part of the publication, plant-food statistics by geographic divisions and units, groups the available data by continents and their respective national subdivisions. A list of the reference material and an appendix containing supplementary tabulated statistics conclude the publication.

AGRICULTURAL BOTANY

La naturaleza de los virus [The nature of the virus], E. ALCARAZ MIRA (*Euclides*, 6 (1946), No. 59, pp. 64-73).—A general review (12 references) and discussion of the nature of plant and animal viruses and bacteriophages.

Carbon dioxide as an essential factor in the bacterial decomposition of cellulose, A. S. PERLIN and M. MICHAELIS (*Science*, 103 (1946), No. 2683, p. 673).—On the basis of tests with *Vibrio parvum* and an unidentified bacterium, the authors claim to have established that CO₂ is essential for the aerobic decomposition of cellulose by bacteria.

Production of antibiotics by fungi, A. H. COOK and M. S. LACEY (*Brit. Jour. Expt. Pathol.*, 26 (1945), No. 6, pp. 404-409).—Inhibitory actions—often of varying kind and degree of permanence—toward a range of gram-positive and gram-negative bacteria including several plant parasites were found in cultures of *Aspergillus*, *Fusarium*, *Chaetomium*, *Trichoderma*, and other minor fungus species. Differential estimates of antibiotic effectiveness showed *A. parasiticus* able to produce at least four antibiotics, including kojic acid and a penicillinlike material. Several *Fusariums* produced solutions active against *Mycobacterium phlei*, as well as other organisms.

Sur l'élaboration et la libération de la pénicilline par le *Penicillium notatum*, P. HEITZMANN and N. GRELET (*Compt. Rend. Acad. Sci. [Paris]*, 222 (1946), No. 13, pp. 762-763).—The authors report the separation of penicillin production by a mycelium during growth on a nutritive medium and its final liberation in a reduced volume of medium in process of exhaustion or in a buffer containing no nutritive elements. The hypothesis is presented that elaboration and liberation of penicillin are partially independent processes.

Influence of the proportions of KH₂PO₄, MgSO₄, and NaNO₃ in the nutrient solution on the production of penicillin in submerged cultures, R. PRATT and K. A. HOK. (*Amer. Jour. Bot.*, 33 (1946), No. 3, pp. 149-156, illus. 5).—The authors studied the accumulation of penicillin in cultures of *Penicillium* strains grown in 65 nutrient solutions containing KH₂PO₄, MgSO₄, and NaNO₃ in different proportions but all with a total molar concentration (of these three salts) of 0.04 M. In addition, the solutions contained lactose and corn steep liquor. The results emphasize the importance of obtaining a proper balance among the concentrations of KH₂PO₄, MgSO₄, and NaNO₃ in the solutions in order to obtain maximum penicillin yields. Pronounced differences in the responsiveness of several strains to changes in the relative concentrations of the three salts were observed.

Antibiotic activity of extract of western red cedar heartwood, C. M. SOUTHAM. (*Soc. Expt. Biol. and Med. Proc.*, 61 (1946), No. 4, pp. 391-396, illus. 1).—Water extracts of *Thuja plicata* heartwood inhibited the growth of a wide variety of bacteria and fungi, due to stasis rather than death of the organisms. The susceptibility of the organisms was unrelated to the gram stain reaction or to morphology. The extract did not lose its antibiotic activity on boiling, on considerable changes in pH, or by treatment with urine or gastric juice; it was, however, inactivated by blood, serum, and cysteine. Large doses of the extract failed to cause death or illness in mice and rabbits. No in vivo activity against infections has as yet been demonstrated.

An antibiotic from *Spiraea aruncus* L., E. P. ABRAHAM, N. G. HEATLEY, R. BOLT, and E. M. OSBORN. (*Nature [London]*, 157 (1946), No. 3990, p. 511).—Some of the properties of an antibiotic isolated from *S. aruncus* suggest that an α - β unsaturated lactone ring may be present in the molecule,

A contribution to our knowledge of the wild and cultivated flora of Pennsylvania, I. H. N. MOLDENKE, (*Amer. Midland Nat.*, 35 (1946), No. 2, pp. 289-399).—The author presents an annotated catalog of 4,321 collections of Pennsylvania plants, representing some 2,185 species, subspecies, varieties, forms, and hybrids in 977 genera and 267 families, as one of a series of papers on the flora of each of the States of the United States and several foreign countries.

Flora of Alaska and adjacent parts of Canada: An illustrated and descriptive text of all vascular plants known to occur within the region covered.—Part V, Cabombaceae to Droseraceae, J. P. ANDERSON (*Iowa State Col. Jour. Sci.*, 20 (1946), No. 3, pp. 297-347, illus. 120).—A continuation (*E. S. R.*, 95, p. 33).

Fruit key to the Umbelliferae in Iowa, with plant distribution records, M. R. MURLEY. (Iowa Expt. Sta.). (*Iowa State Col. Jour. Sci.*, 20 (1946), No. 3, pp. 349-364, illus. 47).

New and noteworthy Asiatic species of Lespedeza, P. L. RICKER. (U. S. D. A.). (*Amer. Jour. Bot.*, 33 (1946), No. 4, pp. 256-258).—Five new species and one new variety are included.

The Mammillaria handbook, with descriptions, illustrations, and key to the species of the genus Mammillaria of the Cactaceae, R. T. CRAIG (*Pasadena, Calif.: Abbey Garden Press*, 1945, pp. 390+, illus. 304).

Physiological studies on some members of the family Saprolegniaceae.—V, Growth substances, K. S. BHARGAVA (*Lloydia*, 9 (1946), No. 1, pp. 13-23, illus. 8).—In further studies of this fungus group (*E. S. R.*, 93, p. 557), *Achlya* sp., *Brevilegnia gracilis*, *Isoachlya anisospora* var. *indica*, and *Saprolegnia monoica* were found capable of unlimited growth on a nutrient medium containing no appreciable amount of thiamine; they synthesize their own from the ingredients of the solution, and some of the thiamine thus elaborated is also given off by the mycelium into the medium. The amount manufactured was greater in cultures kept in darkness than in those exposed to constant light. Addition of vitamins B₁, B₂, C, thyroxine, and β -indolyl 3-acetic acid in low concentrations had no marked effect on the growth of these organisms; higher concentrations of vitamin B₂, C, thyroxine, and β -indolyl-acetic acid retarded their growth. The findings indicate that "*Achlya* sp., *I. anisospora* var. *indica*, and *S. monoica* may be biotin-deficient organisms whereas *B. gracilis* does not require an external supply of biotin."

The vitamin requirements of *Memnoniella* and *Stachybotrys*, P. B. MARSH and K. BOLLENBACHER. (U. S. D. A.). (*Amer. Jour. Bot.*, 33 (1946), No. 4, pp. 245-249, illus. 3).—In studies of the vitamin needs of six isolates of the cellulose-decomposing fungus *Memnoniella* and five isolates of the closely related genus *Stachybotrys*, all were found to require biotin for their growth; the amounts required were, however, very low and of the same order of magnitude as has been found effective by previous workers for several other microorganisms. On the other hand, experiments with 15 other vitamins and similar materials failed to reveal any influence on growth. Abundant sporulation occurred on a synthetic liquid medium containing biotin as the only vitamin, provided a suitable physical substrate for sporulating growth was used. A medium containing mineral salts, agar, and brown sugar proved satisfactory in routine culture procedures for obtaining good growth and sporulation, as also have yeast extract and corn meal agar media. The two fungus groups grew readily on unbleached cotton duck, indicating the presence of biotin in the fabric.

Experiments showing the action of thiamin (vitamin B₁) on the germination and development of orchid seeds in asymbiotic media, J. R. MEYER (*Amer. Orchid Soc. Bul.*, 14 (1946), No. 12, pp. 505-509, illus. 3).—Plants raised from seeds germinated in Knudson's or a modified Sladen's solution in test tubes made much better growth with than without added thiamine. The observation is made that perhaps this vitamin may be one of the factors of interchange in the symbiosis between orchid plants and certain fungi. There are 18 references.

The influence of kernel size, age, location in panicle, and variety of oat, on the variability of the *Avena* test, W. P. JUDKINS. (Ohio Expt. Sta.) (*Amer. Jour. Bot.*, 33 (1946), No. 3, pp. 181-184, illus. 1).—No factors were discovered in this investigation which would account for the marked variations in curvature, but the following conclusions—all applying specifically to the Skoog "deseeded" method (E. S. R., 78, p. 26)—are considered of interest and have at least a minor influence on the uniformity of the *Avena* test results. Coleoptiles growing from small-sized kernels of Victory oats were somewhat more sensitive to the unilateral application of auxin than were the coleoptiles from large kernels. Coleoptiles from comparable kernels of spikelets from different parts of the panicle exhibit similar sensitivity in the test; those from the small apical kernels of the spikelet make greater curvatures in the test than those from the large basal grains. This substantiates the data secured from the mechanical sorting of a random sample of oats. The age of oats seed (from 9 to 24 mo.) had no significant influence on sensitivity to auxin of coleoptiles produced from such kernels. Coleoptiles of early-maturing oats varieties were less sensitive in the hormone test than were those of late varieties. The Victory oats—commonly used in plant hormone work—is a late-maturing variety.

Experiments on the effects of animal sex hormones on dioecious plants, A. and D. LÖVE. (*Arkiv Bot.*, 32 (1945), No. 3-4, [Sect. A, Art. 13], pp. 60, illus. 38).—In a 4-yr. study of the effects of animal sex hormones on dioecious plants, they were found to stimulate cell divisions; it is suggested that they belong to the bios group of phytohormones. These hormones affected sexual development in the plants studied. In *Rumex* only a very weak positive influence was noted, but in *Melandrium* a clear positive effect in the ♀ direction was observed in the series treated with estrone, estradiol, and estradiolbenzoate, and in the ♂ direction in the series treated with testosterone and testosteronepropionate. No such effect was observed after treatment with heteroauxin, aneurin, and cholesterin. When series of *Melandrium* plants were treated with water solutions of the hormones no effect was noted; all positive results were obtained in series treated with the hormones in lanolin paste applied to the young stems before flowering. A poisonous effect of the hormones directly proportional to their concentration was clearly observable in all the series. No sex reversal was found after grafting the different sexes on each other.

Auxin-protein complexes of the wheat grain, S. A. GORDON (*Amer. Jour. Bot.*, 33 (1946), No. 3, pp. 160-169, illus. 1).—Auxin was found associated with each of the five major proteins isolated from the wheat grain; considerably more was obtained from the albumin, globulin, and proteose of the embryo than from the prolamine and glutelin of the endosperm by tryptic digestion. Auxin was secured only from the α-fraction when the α- and β-components of the glutelin were enzymatically hydrolyzed. Auxin was obtained from the globulin and proteose by enzymatic digestion but not by alkaline treatment; with prolamine, glutelin, and albumin, either method yielded

auxin. Two types of auxin—(1) acid-stable alkali-labile and (2) acid-labile alkali-stable (indoleacetic acid type)—were found. Both types were in the free auxin of the grain. By tryptic digestion, type (2) was obtained from the globulin and proteose; type (1) and possibly type (2) were secured from the prolamine, glutelin, and albumin. Only type (2) was obtained by alkaline treatment of the latter proteins and by alkaline treatment of the whole grain. Electrodialysis experiments indicated auxin to be associated with the proteins as an adsorbed or unstably bound electrolyte. Though digestion of the various proteins was necessary to obtain specific types of auxin, there was no correspondence between the rates of protein hydrolysis and of auxin formation. The implications of these findings to methods of auxin extraction and to some concepts of auxin origin are discussed.

The construction and installation of thermocouples for biological research, R. EGGERT. (N. H. Expt. Sta.) (*Jour. Agr. Res. [U. S.]*, 72 (1946), No. 11, pp. 341-355, illus. 4).—The potentiometer-thermocouple method of measuring internal temperatures in plants is said to be accurate if the thermocouples are properly installed. Within working limitations, the size of the hole in which a couple is placed is less important than other factors of installation; from the standpoint of injury to plants, however, the smallest hole in which a junction can be inserted is best. In order to obtain an accurate reading of temperature in live wood tissue during rapidly rising or falling temperature it is necessary that about 3 in. of No. 30 copper-constantan lead wire be embedded at the same depth as the thermocouple junction to "isolate" the junction and dissipate the effect of heat which tends to be conducted toward or away from that point. Plant tissues vary greatly in texture and structure as well as in moisture content at different periods of the year. Since the measurements taken in this investigation were made on green maple filled with sap and on comparatively dry apple wood, it is suggested that this 3-in. distance would probably be satisfactory in any plant tissue if wire of the same description were used. A method is described for inserting thermocouples in tree trunks. The plug which holds the junctions firmly in place in the plant should best be of waterproof substance; grafting wax is suggested. Thermocouples should be installed in the cambium of trees in a position parallel with the length of trunk or limb to insure more accurate readings on any one side of the tree; they should also be constructed of as fine wire as possible to avoid thermal conductivity toward or away from the junctions under conditions of changing temperature.

Gas change and frost hardening studies in winter cereals, G. ANDERSSON (Lund, [Sweden]: Hakan Ohlssons, 1944, pp. 163, illus. 28; Ger. abs., pp. 146-151).—The main object of this comprehensive study was to demonstrate the mode of formation of the sugar accumulated during hardening of overwintered cereals; the hardy and very hardy varieties of rye and fairly hardy and nonhardy varieties of wheat used exhibited a fairly high assimilatory rate even at low temperatures. In studies of the effect of light on the assimilatory rate, the curves obtained were logarithmic. With regard to assimilation, the plants behaved as typical sun plants; with regard to respiratory rate and the position of the compensation point, they acted like shade plants. The result was that they carried on their activities very economically and were fully able to form by photosynthesis the amounts of sugar accumulated during hardening. The rates of both assimilation and respiration increased with rises in temperature, but the former was far less influenced than the latter.

In some of the experiments carried out under controlled light and tem-

perature the duration of the light period was varied; in others, the CO_2 concentration. During hardening, determinations were made of assimilatory and respiratory rates, contents of dry matter and sugars, and frost resistance. From the data for gas exchange the amount of sugar formed and accumulated was calculated, and the calculated amounts were compared with those found by direct analysis. Light proved necessary for both hardening and sugar accumulation; when the light period was shortened by half, the rate of hardening was slowed proportionately. CO_2 proved necessary for both processes, and the rate of hardening varied proportionately with the CO_2 content of the air.

Under hardening conditions (3° – 4°C . plus light), growth was almost completely inhibited, the respiratory rate decreased considerably, and the assimilatory rate became far less; the result was an increase in sugar content and a parallel increase in dry matter. Increase was most rapid the first day, then gradually diminished in intensity for the 3 weeks of the test. In hardy varieties—especially in rye—very high values were reached, the highest being 67.9 percent of dry matter. The frost resistance also increased to a corresponding degree. The amounts of sugar calculated from the values for assimilation and respiration agreed well with the amounts found. This fact, as well as the dependence of hardening on light and CO_2 and the parallelism between increase in sugar and dry matter, is taken as proof that the sugar was formed by photosynthesis. When the hardening process had gone on for some time, the assimilatory rate began to decrease and the respiratory rate to increase. The daily surplus of assimilates diminished, and after about 3 weeks a balance was attained and the hardening process was finished. The decrease in assimilatory rate, as well as the increase in respiratory rate, is believed to be caused by the accumulation of assimilates. The whole plant was hardened—leaves, stem, and roots, the last by transport of sugar from the leaves. During the first part of the hardening process only the monosaccharides increased; later on, only the disaccharides. The means by which the two forms of sugar effect an increase in hardness may thus differ fundamentally. Varietal differences were observed in sugar accumulation and hardness, as well as in assimilatory and respiratory rates. A hardier variety reached the balance at a higher sugar content than a less hardy one, and the daily assimilation surplus of the former was higher.

Über das Wachstum einiger *Coprinus*-Arten bei verschiedenen Wasserstoffionenkonzentrationen (Vorläufige Mitteilung) [Growth of *Coprinus* species at various H-ion concentrations (preliminary contribution)], L. FRIES (*Arkiv Bot.*, 32 (1945), No. 3–4, [Sect. A, Art. 10], pp. 8, illus. 5).

Plant growth with nutrient solutions, I–III (*Jour. Agr. Sci. [England]*, 36 (1946), No. 2, pp. 69–94).

I. *A brief review of existing work*, D. A. Johnson and R. M. Woodman (pp. 69–79).—This review (153 references) is concerned with the early history of water cultures (1699–1910), the triangular system and 3-salt solutions, miscellaneous considerations, general discussion of the methods used, and practical aspects.

II. *A comparison of pure sand and fresh soil as the aggregate for plant growth*, R. M. Woodman and D. A. Johnson (pp. 80–86).—Statistical experiments were carried out with pot cultures in the greenhouse—with sand and soil as the aggregates (nutrients being supplied to both as nutrient solutions)—on the growth of turnip and spring cabbage to the stage of maturity usual in practice. With full nutrients, the soil—possibly because of such factors as its nutrient reserves, its physical properties, and its capacity for

retaining certain of the nutrient elements supplied—proved superior to the sand as judged by yields of fresh and dry matter for tops and whole plants of both vegetables, and for roots of turnip, thus including the edible parts of both plants; the (true) root of the cabbage, however, yielded more in the sand. Similar results were obtained even when the concentrations of nutrients for the soil were only half those in the full nutrient solution applied to the sand; it may thus be stated that fresh soil is greatly superior to sand under equal conditions as an aggregate in the growth of vegetables with nutrient solutions.

III. *A comparison of sand and soil as the aggregate for plant growth, using an optimum nutrient solution with the sand, and incomplete supplies of nutrients with "once-used" soil*, R. M. Woodman and D. A. Johnson (pp. 87-94).—In this series, sand with full nutrients proved superior to once-used soil with water only, but once-used soil supplied with the full quota of soluble N was superior to the sand with full nutrients. Cabbage roots in sand were the exception; a possible explanation is that sand as an aggregate favors true root formation, while soil favors the formation of tops. The once-used soil in these tests deteriorated in physical properties owing to the conditions of the experiment, which included use of N as NaNO_3 , possibly owing to the tendency to form sodium clay; it is argued that a judicious choice of fertilizers and/or use of flocculating electrolytes should overcome such tendencies.

Culture prolongée de tissus végétaux en l'absence de facteurs de croissance [Prolonged culture of plant tissues in the absence of growth factors], P. NOBECOURT. (*Compt. Rend. Acad. Sci. [Paris]*, 222 (1946), No. 14, pp. 817-818).—The author reports successful culture of morphologically undifferentiated tissues of the rose for over 2 yr.—the last 13 mo. without added growth factors, in spite of which vigorous growth took place.

Further experiments on the culture of excised asparagus stem tips in vitro, S.-W. LOO (*Amer. Jour. Bot.*, 33 (1946), No. 3, pp. 156-159, illus. 8).—The potentiality of indefinite growth of excised asparagus stem tips previously reported (E. S. R., 92, p. 773) is further confirmed. These excised stem tips were kept growing in vitro for 22 mo. through 35 successive transfers. A dilute (0.5 percent) agar medium proved as good as, if not better than, a liquid medium and also provided a simple method for supporting the stem tips. The appearance of cladophylls on the stem tips greatly accelerated growth. Five clones of excised stem tips have now been established; the largest consists of 16 stem tips and the number is still increasing. Histological studies revealed no significant difference between excised stem tips grown in the light and the normal plant.

Cultivation of excised stem tips of dodder in vitro, S.-W. LOO (*Amer. Jour. Bot.*, 33 (1946), No. 4, pp. 295-300, illus. 4).—The author reports maintaining excised stem tips of dodder in vitro for 5 mo. through several transfers. These tips produced lateral buds and flowers in a simple medium without formation of leaves or roots. This is believed to be the first case of floral organs developing on excised stem tips in vitro. A considerable amount of chlorophyll was produced in the excised tips; this probably plays an important role in maintaining growth of the culture. No indication of the development of haustoria on the excised stems was noted. Sugar proved essential for growth of the stem tips. Other supplementary substances tested—including lyophilized whole cytoplasm from leaves of host plants—failed to promote growth.

Effect of osmotic pressure on water absorption and germination of alfalfa seeds, R. UHVRIS. (U. S. D. A. et al.). (*Amer. Jour. Bot.*, 33 (1946),

No. 4, pp. 273-285, illus. 5).—Alfalfa seed germination was tested in petri dishes and sand cultures on substrates supplied with solutions of NaCl and mannitol at osmotic pressures of 1 to 15 atmospheres. In all cases, the higher the concentration the lower were the rate and percentage of germination; this retardation and reduction were greater on NaCl than on mannitol substrates at equal osmotic pressures. Germination was practically inhibited on NaCl solutions of 12 to 15 atmospheres. With either chemical, the hydration of seeds decreased as the concentration of the substrate increased; where the percentage germination was very low, the average absorption was also uniformly low. Differences in response to the two substrates at isotonic concentrations suggest a toxic effect of NaCl; this effect increased with increase in concentration of NaCl. Absorption of chloride increased with increase of NaCl in the substrate. A measure of comparative injury from the two chemicals is shown by the higher percentage of recovery and the smaller number of deformed seedlings on mannitol substrates of high concentration than with isotonic concentrations of NaCl. The higher the concentration of NaCl in the sand culture, the greater was the seedling mortality.

The effect of iron and other factors on the production of pigment by the yeast *Torulopsis pulcherrima*, C. ROBERTS. (Univ. Calif.). (*Amer. Jour. Bot.*, 33 (1946), No. 4, pp. 237-244, illus. 12).—Ten single-cell isolates of this yeast, varying in the amount of red pigment produced when maintained under uniform laboratory conditions, were subjected to alterations of environal factors to determine how such changes influence pigment production. Nine isolates reacted similarly to all the environal factors tested. One pure white variant, which had remained stable in culture for over 2 yr., showed no change during several of the tests; it then suddenly gave rise to a red pigment and in subsequent tests reacted toward the environal changes as did the other isolates.

A relationship between pigmentation and the total amount of nutrient substances available to the colony was revealed. Light was without effect on pigmentation. Although the total amount of pigment formed in each isolate was apparently not influenced by the temperatures maintained, those below 16° and 19°C. appeared to favor retention of the pigment within the colony, while higher temperatures permitted the pigment to diffuse out into the medium. Increasing concentrations of ferric ammonium citrate added to the basal medium were correlated with an increase in intensity of colonial pigmentation up to a concentration of 0.1 percent. Diffusion of the pigment increased with an increase in Fe salt concentration up to 0.001 percent, but fell rapidly to 0.01 percent. At concentrations inhibitory to diffusion the pigment was retained within many of the individual cells; only rare instances of cellular retention occurred at concentrations allowing diffusion to occur. As the pH of the medium increased from 4.8 to 6.2, the pigment intensity of the colonies decreased, while the diffusion of the pigment increased. In the absence of O₂, pigment formation was inhibited; within 5.5 hr. after restoration of aerobic conditions, however, pigment appeared. The evidence adduced substantiated M. W. Beijerinck's claim that individual cells which accumulate the pigment are incapable of further growth, and that the stable white variants have lost their ability to elaborate the precursor of the pigment.

Absorption, transport, and exudation of inorganic ions by the roots, H. LUNDEGARDH. (*Arkiv Bot.*, 32 (1945), No. 3-4, [Sect. A, Art. 12], pp. 139, illus. 22).—Using the root systems of wheat seedlings, the author found that

the plasma membrane of cells behaves as an amphoteric colloid with predominating acid dissociation. Free permeation of salt ions through the neutral main substance of the membrane occurs only to a limited extent in the root. The passage of ions in and out is mainly regulated by exchange processes obeying the principle of membrane equilibrium and the law of mass action. Accumulation of free salts (anion + cation) against diffusion gradients cannot, however, be explained by adsorption or ion exchange alone. The salt concentration level in a cell is regarded as a dynamic equilibrium between passive exudation and active absorption. Exudation dominates in the central parenchyma of the apical part of the stele; absorption, in the peripheral cells of this zone. Bleeding is a passive exudation of salts actively accumulated in the epidermis and transported in a centripetal direction; an exudation of "extra water" also occurs, owing to metabolic processes in the stele. Active absorption of salts is causally related to the anion respiration, viz, a desmolysis of glucose under CO_2 evolution. Intermediary products of desmolysis are further oxidized, and the apparent necessity of this combustion for normal life of the wheat roots explains the aerobic character of an enduring anion respiration. No direct relation was noted between absorption of ions and protein synthesis or growth intensity. A theory of anion respiration is developed, according to which the transport of anions as an accessory process is connected with the change in valency of Fe atoms in a respiratory hemin system. The cations of a salt are more "passively" adsorbed in the protoplasm, owing to its dominating acid dissociation; they are liberated at points of the cell or tissue where anions are actively accumulated. Anions are also produced or consumed in the metabolism. A certain minimum power of anion respiration is necessary to maintain the accumulation of inorganic salts in the cell. A theory is presented, according to which the aging of the plasma is correlated with the observed disappearance of nucleic acids. The permeability of root tissues to water is slightly influenced by cations.

Bleeding of decapitated plants is the visible sign of a normally occurring continuous exudation of liquid into the central vessels of the root ends. According to the theory advanced, the hydrostatic pressure of the bleeding sap is identical with the turgor pressure of the exuding parenchyma cells. The total bleeding is the sum of the exuded salt solution and the extra water. Exudation of solution occurs when osmotically active substance is given off from a cell; of extra water, when osmotically active substance is transferred into osmotically inactive substance (e. g., protein). The bleeding sap of wheat seedlings is an inorganic salt solution. The concentration of the sap is not influenced by the osmotic value of the medium (within 6 hr.); only the ion supply to the exuding parenchyma is of deciding influence. The anion respiration is a regulative factor. According to the theory, the sap concentration reflects the osmotic properties of the exuding cells. The amount of water carried by one exuded salt ion is inversely proportional to the osmotic value of the exuding cell. The intensity of the bleeding is a resultant of the availability of salt ions, metabolic processes, and osmotic counter pressure of the medium. The relation between the osmotic value of the medium and the intensity of the bleeding is expressed in a formula and discussed. The theory further explains why the exuded sap can be more diluted than the medium. New viewpoints are developed concerning the migration of solutes in the plant and the participation of metabolic processes in the movement of water. As an example of a "desalting" of the sap owing to a deposit of salts in aeral organs, a number of analyses of the

guttation liquid are presented. A limited desalting is believed to occur in the older parts of the roots and in the base of the stem. There are nearly three pages of references.

Effects of various concentrations of boron on the development of *Taraxacum kok-saghyz* in sand culture, B. S. MEYER. (Ohio State Univ.) (*Amer. Jour. Bot.*, 33 (1946), No. 3, pp. 204-209, illus. 1).—In this study, maximum root yields were obtained at 10 to 15 p. p. m of B, though moderately good development of the plants occurred over a considerably wider range. Kok-saghyz thus has a considerably higher B requirement and tolerance than most other species which have been investigated. Foliar symptoms could be recognized for B deficiency but not for B toxicity. The findings also suggest that the B concentrations favoring maximum root development also result in the highest percentage rubber contents in the roots, but the data on this point are inconclusive.

Influence of time of day on latex flow from *Cryptostegia grandiflora*, J. T. CURTIS and R. BLONDEAU. (Univ. Wis.). (*Amer. Jour. Bot.*, 33 (1946), No. 4, pp. 264-270, illus. 6).—In studies of latex and rubber production from various plant parts of *C. grandiflora* at different hours of the day on both wild and plantation plants under semidesert conditions in Haiti, minimum yields were always obtained during the midday hours. Rubber yields from the bark of old trunks and from young fruits continued low throughout the afternoon, whereas yields from the whiplike vegetative branches returned in the late afternoon to a point equalling or exceeding that of the early morning. The time of medium yield was correlated with that of greatest atmospheric evaporating power as measured by the vapor pressure deficit. Latex composition changed considerably through the day, the rubber fraction of the total solids varying from 50 percent in early morning to nearly 65 percent at noon for the whip latex. The acidity of the latex also varied, being most acid in the midday hours and least so in early morning and late afternoon. Only minor diurnal differences were found in quality of rubber obtained by latex coagulation. In practice, it appeared that only morning tapping should be used for trunk latex collection, but that whip and fruit latex could be collected throughout the day, with provision for a relatively long noontime rest period.

Amide synthesis in plants.—II, Amino-acid changes in germinating seedlings, M. DAMODARAN, R. RAMASWAMY, T. R. VENKATESAN, S. MAHADEVAN, and K. RAMDAS. (*Indian Acad. Sci. Proc.*, 23 (1946), No. 2, Sect. B, pp. 86-89, illus. 4).—In the present study (E. S. R., 86, p. 303), the amino acid changes taking place during protein regeneration in seedlings of three legumes—*Dolichos biflorus*, *Phaseolus mungo*, and *Cicer arietinum*—were considered. The first observed metabolic change noted was the rapid solubilization and hydrolytic break-down of the seed protein. The soluble N reached a maximum within 24 hr. of germination, followed by protein hydrolysis and conversion of the greater part into amino acids and later to amides. During seedling growth all amino acid fractions decreased except for dicarboxylic acids and their amides. Both asparagine and glutamine increased to many times their initial values, but the amount of glutamine was always much the smaller. From the conditions under which the plants were grown, asparagine formation must be considered a normal stage in protein regeneration in plants. The presence in the seedlings of a third amide was inferred because (1) the amide N in the aqueous extracts of the seedlings was greater than could be accounted for by the sum of asparagine and glutamine amide N present and (2) because amides were present in excess of the

dicarboxylic acids—especially in *D. biflorus* and *P. mungo*. In these two species asparagine accumulation occurred without a corresponding increase in dicarboxylic acids, indicating the possibility of a conversion of glutamic into aspartic acid. The strikingly rapid disappearance of arginine observed in some of the seedlings suggests that this amino acid plays a special role as an amide precursor.

Relation of anaerobic to aerobic respiration in some storage organs with special reference to the Pasteur effect in higher plants, C. O. APPLEMAN and R. G. BROWN. (Md. Expt. Sta.). (*Amer. Jour. Bot.*, 33 (1946), No. 3, pp. 170-181).—Both forms of respiration were determined in a number of different storage organs—chiefly vegetables—under a wide variety of circumstances. At 22°C., the anaerobic respiration either remained fairly constant for the short experimental period or declined at the same rate as the aerobic form. Any pronounced alteration in rate of aerobic respiration was accompanied by an alteration in the same direction of anaerobic respiration, but only in a few cases were both types affected to the same degree. The most pronounced acceleration of aerobic respiration occurred for a time in potatoes after cold storage, wounding, or treatment with ethyl bromide gas; the anaerobic form was very much less affected by these treatments. An increase of imbibed water in corn caused a great increase in both aerobic and anaerobic respiration. The ratios of anaerobic to aerobic respiration in carrots, parsnips, tomatoes, and McCormick potatoes had different values at high and low respiration temperatures; these ratios had about the same value at the high and low temperatures only in Russet Burbank potatoes and sweet corn. The ratios of anaerobic to aerobic respiration remained fairly constant during the decline of respiratory intensity in potatoes immediately after harvest and also in sweet corn at different stages of maturity and during the decline in respiration with time of storage.

The quotient CO_2 output in N/CO_2 output in air is expressed as I/N ; this ratio closely approximated the theoretical value of 0.33 for alcoholic fermentation and aerobic respiration in green sweet corn at 27°, Russet Burbank potatoes and onions during the initial period of high respiration after cold storage, and potatoes after wounding or treatment with ethyl bromide gas; these ratios were greater than unity at 22° only in carrot and parsnip roots and in McCormick potatoes. The I/N ratios closely approached unity in Irish Cobbler and Russet Burbank potatoes under most of the experimental conditions and in tomatoes at different stages of ripening and at a respiration temperature of 5.5°. All the other plant organs under the different experimental conditions gave I/N ratios much below unity, but somewhat greater than 0.33.

The Pasteur effect was very pronounced in carrot and parsnip roots and in McCormick potatoes. In some cases the quantity of CO_2 liberated by carrot and parsnip roots in N was nearly twice that liberated in air. The results with whole carrot roots confirmed Marsh and Goddard's results on slices of carrot root. The pronounced Pasteur effect exhibited by parsnip roots and by a variety of Irish potato has not been previously reported. Carrot and parsnip root tissue should prove favorable material for studying the mechanism of the Pasteur effect because of its magnitude in these tissues. The Pasteur effect, which is the basis for Blackman's theory of oxidative anabolism in his general scheme of the respiratory process in higher plants, has been reported in several plant organs but does not appear to be of universal occurrence in higher plants.

Photoperiodism in jute, J. C. SEN GUPTA and N. K. SEN (*Nature [London]*, 157 (1946), No. 3994, pp. 655-656).—Jute is one of the most important fiber plants of Bengal, and two species—*Corchorus capsularis* and *C. olitorius*—are under cultivation. Day-length tests indicated both to be short-day plants with the critical light period apparently around 12.5 hr. The long vegetative period of plants sown in April-May seems to be influenced by the long light periods of May-July more than by any other factor. Earliness of flowering due to short photoperiodic effects is shown not to be inherited. From the standpoint of fibers, the earliness of flowering due to short photoperiod treatments is of no advantage since these plants remain dwarf and become bushy, rendering them of little value for fiber; it has great significance, however, from the standpoint of breeding and for raising seeds, as it may be possible to obtain more than two or three crops in a growing season.

Another superior pith for free-hand sections, R. L. STEYAERT (*Science*, 103 (1946), No. 2684, p. 695).—The author reports such satisfactory results with cassava pith that elder pith has been entirely discarded.

Studies of development in long shoots and short shoots of Ginkgo biloba L.—I, The origin and pattern of development of the cortex, pith, and procambium, J. E. GUNCKEL and R. H. WETMORE (*Amer. Jour. Bot.*, 33 (1946), No. 4, pp. 285-295, illus. 16).—This morphological study is limited to a consideration of the development of the shoot system, of which there are two well-defined types—long shoots and spur, dwarf, or short shoots.

The inhibiting effect of the terminal bud on flower formation in the axillary buds of the Haden mango (*Mangifera indica* L.), P. C. REECE, J. R. FURR, and W. C. COOPER. (U. S. D. A.). (*Amer. Jour. Bot.*, 33 (1946), No. 3, pp. 209-210).—Inflorescences in the mango are determinate and appear under normal conditions only from terminal buds. When, however, the terminal buds were removed during the flowering period, inflorescences were produced by axillary buds in the distal region of the shoot. Normally the axillary buds remain dormant during the period, but later some of them produce vegetative shoots. Results of experiments on girdled decapitated branches which were defoliated at various intervals after removal of the terminal bud indicated that when leaves were present above the girdle, floral induction took place in the axillary buds between 1 and 4 days after decapitation and that floral differentiation rapidly followed.

Latex-tube areas of the roots and leaves of the Russian dandelion, E. F. WOODCOCK. (Mich. Expt. Sta.). (*Jour. Agr. Res. [U. S.]*, 72 (1946), No. 9, pp. 297-300, illus. 1).—This study was made of *Taraxacum kok-saghyz* to determine the number of latex tubes in petioles of different leaves from the same plant, the total latex-tube area at different levels in the same primary root, the total latex-tube area in the primary root v. its secondary roots, and that in the secondary roots arising from a single primary root. The findings failed to show any trend enabling the determination of the total latex-tube area in a root system by examination of the primary root or of one secondary root of the system, or of one petiole of the plant.

GENETICS

A new gene theory and an explanation of the phenomenon of dominance to mendelian segregation of the cytogene, C. C. LINDEGREN (*Natl. Acad. Sci. Proc.*, 32 (1946), No. 3, pp. 68-70).—The experiments reported [presumably on yeasts] are said to indicate that the locus—which the author proposes to call the "chromogene"—is simply a place of attachment for the cytogene.

This view corroborates the principle of the duality of the gene, with the significant difference that the cytogene is an entity capable of self-duplication in the cytoplasm. A cell containing the dominant (fermenting) gene is capable of fermenting a specific carbohydrate, thus showing that it is capable of releasing the cytogene. In some recent experiments, the author mated a clone carrying the dominant allele to one carrying the recessive (nonfermenting) allele; some of the recessive haploid clones obtained from the hybrid were contaminated by the cytogene; we may thus speak of dominant, contaminated, and recessive alleles. When a contaminated by recessive hybrid underwent reduction, regular segregation of fermenter to nonfermenter occurred in most asci; thus a cytoplasmic character exhibited mendelian segregation. Plasmagenes or viruses are considered to be modified cytogenes which can be transmitted without recourse to a chromosome locus. Simple "loss" mutations may result from either (1) transforming the chromogene into a site no longer having affinity for the cytogene, or (2) complete destruction or loss of the cytogene. Some hypomorphic mutations may be changes in the locus which reduce the affinity of the chromogene for the cytogene; other mutations may be alterations in the structure of the cytogene or simultaneous alteration in the chromogene and cytogene. Further details are to be reported later.

A technique for counting numerous chromosomes, T.-T. CHEN. (Univ. Calif.). (*Jour. Morphol.*, 78 (1946), No. 2, pp. 221-230, illus. 11).—The method consists essentially in the use of a special ocular disk in drawing chromosomes—the drawings being made on celluloid sheets. This technic was devised for studies of polyploid races of *Paramecium*, but it is believed it would prove useful also for other organisms having numerous chromosomes.

The morphological variations and the occurrence of aneuploids in some species of *Agrostis* in Rhode Island, I. H. STUCKEY and W. G. BANFIELD. (R. I. Expt. Sta. coop. U. S. D. A.). (*Amer. Jour. Bot.*, 33 (1946), No. 3, pp. 185-190, illus. 18).—Widely divergent morphological types were found within single progenies of this grass genus, collected in Rhode Island. These differences were greater than is usually found within a species, and individual plants could be identified as *A. tenuis*, *A. alba*, or intermediates between these species. Chromosome counts of these plants ranged from 28 to 42, with no correlation between morphological type and chromosome number. At present no explanation is offered as to the reason for the occurrence of these aneuploid chromosome numbers or for the morphological variations.

Experimental study of convergent improvement and backcrossing in corn, H. K. HAYES, E. H. RINKE, and Y. S. TSIANG. (*Minnesota Sta. Tech. Bul.* 172 (1946), p. 40, illus. 8).—A study of convergent improvement, carried out with two single crosses as a basis, 11 × C23 and 14 × A374, used inbred lines from the double cross Minhybrid 403 in its original form with the pedigree (11 × 14) (C23 × A374). Two and three generations of backcrosses were made before selection in selfed lines was practiced. Numerous pollinations were made during each segregating generation of backcrosses and selfed progenies. Selection was primarily on the basis of the most desirable cultures and also on individual plant basis. Convergent improvement studies also were made of (11 × 14) and backcross studies of (49 × 14) backcrossed to 14 for two or three generations, and of (49 × 14) 11 backcrossed twice to 14. Backcrossing was studied also as a means of improving B164, a smut-susceptible line, by crossing it with 37, a smut resistant inbred from Minn. No. 23. Inbreds 11 and 14 are from Minn. No. 13, while C23 and A374 are Holbert's selections from Reid Yellow Dent. A375 is now used

in Minhybrid 403 in place of C23. C23, A374, and A375 are so closely related that no single cross between them yields well enough to be used as a female parent of the double cross. A375 is closely related to A374 and is considerably earlier in maturity than C23. Indications are that A375 is somewhat superior to C23 for use in the double cross Minhybrid 403. The merits of several lines in various hybrid combinations are treated in some detail.

The convergent improvement and backcrossing studies are discussed in relation to the principle of gamete selection. It seems probable to the authors that inbred lines may be the most satisfactory source, in many cases, of gamete selection to improve the combining ability of an inbred line in a specific cross. Gamete selection, when inbred lines are used as a source, would consist of a comparison of the value of particular inbred lines as a source of improved gametes.

The duration of pedigree herds in three breeds of cattle in relation to selective breeding, H. P. DONALD and A. A. EL ITRIBY (*Jour. Agr. Sci. [England]*, 36 (1946), No. 2, pp. 100-110, illus. 3).—The work reported was designed to yield information on the duration of British pedigree cattle herds, with special reference to (1) the duration of herds now defunct, and (2) the age of existing herds. A study was therefore made of the duration of samples of pedigree herds in order to obtain some indication of the time actually spent by breeders in the selective breeding of dairy cattle. The samples consisted of pedigree Ayrshire, Jersey, and Shorthorn herds (1) established at various fixed times in the past and (2) existing in 1939. The former were traced forwards, and the latter backwards, by means of herd-book registrations. Each sample contained not less than 300 herds, and the distribution of durations in each was considered in relation to the movement of population numbers in the whole breeds from which they were drawn.

Ayrshire herds established in 1905-12 averaged more than 16 yr. in duration, although 24 percent were dispersed within the first 5 yr. of existence. Another 26 percent were transferred at some stage from the original breeder to a member of his family, the average time spent in pedigree breeding by the original breeder being more than 13 yr. Jersey herds established in 1924-38 disappeared at the rate of 50 percent in the first 5 yr. and 17 percent in the next 5 yr. Similar figures were found in the Shorthorn sample established in 1870-74, but these two breeds were not expanding rapidly in the periods considered. The rate at which herds were dispersed appeared to decline from about 50 to 30 percent with increasing duration in the Jersey and Shorthorn samples, but in the Ayrshire sample it was maintained at about 20-26 percent up to the group of herds which had lasted 20-25 yr.

The average durations (in years) up to 1939 of herds existing in 1939 were 13.4 (Ayrshire), 11.4 (Jersey), and 14.3 (Shorthorn).

It is concluded that the average breeder may, under favorable conditions, succeed in breeding up to three generations of dairy cattle, but that when a breed is not expanding it may well be little more than two generations. As many as 40 percent or more of existing herds may have been established for only 1-5 yr., and of all herds started some 50 percent may never exceed this in breeds which are not expanding. Herds existing in 1939 were found to include 15-27 percent (9-20 percent if transfers are excluded) which had lasted more than 20 yr.

"The lack of continuity implied by these observations must be a serious drawback in constructive breeding for all but a minority of pedigree breeders.

Furthermore, if a superior strain is produced, there is a strong probability that it will be lost by dispersion (if not by outcrossing) within a short time."

The growth and distribution of the pedigree Red Poll cattle population in England. H. P. DONALD (*Empire Jour. Expt. Agr.*, 13 (1945), No. 52, pp. 169-183, illus. 4).—The origin and growth of their breed in England is discussed, including its relations to adaptation to environment and to the genetical implications of population size.

The breeding value of Friesland bulls in South Africa. F. N. BONSMAN (*Farming in So. Africa*, 21 (1946), No. 241, pp. 231-248, illus. 6).—A study of the breeding value of Friesland bulls used in the pedigree herds of South Africa is reported, primarily concerned with a study of the breeding value of Friesland bulls for milk production and butterfat percentage. Wherever it was practicable, as many as possible of the progeny of a number of bulls were inspected and judged for conformation and type. In addition, an analysis was made of the available official score cards for conformation of the male and female progeny of a sire in order to establish some measure of the standard of excellence of his progeny. The data obtained for two of these bulls are presented and discussed.

The influence of age on breeding efficiency of dairy cattle in artificial insemination. T. TANABE and G. W. SALISBURY. (Cornell Univ.). (*Jour. Dairy Sci.*, 29 (1946), No. 6, pp. 337-344).—This is an analytical study of 12,621 services to purebred Holstein-Friesian heifers and cows over a period of 4 yr. The average number of services required per conception when based on all females, infertile cows included, was 2.07, or a breeding efficiency of 48.2 percent.

On the whole the influence of the age of the cow and the age of the sire on breeding efficiency in artificial insemination was found to be very similar to that reported for natural breeding. The lower rate of conception reported for uncalved heifers in natural service has been found equally applicable under conditions of artificial insemination where the incompatibility of size and weight is no longer an influencing factor. The characteristic decrease in the level of fertility of cows 10 yr. of age and over also held true in artificial insemination. Despite the attempt to retain and use highly fertile bulls in artificial insemination, young bulls between the ages of 1 and 3 yr. maintained the highest levels of fertility.

The effect of sulfanilamide upon the livability and metabolism of bovine spermatozoa. C. B. KNOTT and G. W. SALISBURY. (Cornell Univ.). (*Jour. Dairy Sci.*, 29 (1946), No. 5, pp. 285-291).—Primarily because of its bearing on artificial insemination, studies were undertaken to determine the levels of sulfanilamide required to prevent growth of the bacterial types found in semen collected from bulls and the effect of the sulfanilamide on the livability and metabolic activity of spermatozoa. The addition of 300 mg. of sulfanilamide per 100 cc. of yolk-citrate diluent gave a significant improvement in the livability of ejaculated bull spermatozoa over a 20-day storage period and prevented bacterial growth. Sulfanilamide depressed glucose and oxygen utilization at all concentrations studied. The accumulation of lactic acid was increased both absolutely and in relation to the glucose utilized in the presence of sulfanilamide.

The data obtained on the effect of sulfanilamide on the fertility of diluted bull semen are regarded as preliminary, but no deleterious influence on conception rate was indicated. "It would appear from these studies that in sulfanilamide or other sulfonamides a key to the control of bacteria in semen and control of possible spread of certain infections by artificial breed-

ing is available. The action of sulfanilamide is selective for it is either bacteriocidal or bacteriostatic, but permits bull spermatozoa to live longer."

Review of some range-sheep breeding projects in Canada, K. RASMUSSEN (*Empire Jour. Expt. Agr.*, 13 (1945), No. 52, pp. 213-223).—Breeding projects started in 1919 with range sheep are described and the following conclusions drawn: "The Rambouillet, with all its defects, still remains the foundation breed for western Canadian ranges. Careful selection and mating has led to improvement in all the characteristics in which the Rambouillet has been most defective.

"The Canadian Corriedale has progressed to the point where it can be considered as a distinct breed. It requires improvement in body size and rate of growth, but even at its present state it is very desirable for crossing with range flocks. In crosses with Rambouillets it produces progeny that are smoother, have longer staple, and a more open face than if Rambouillet rams were used.

"The crossbreds are practically equal to the Rambouillets in rate of growth and weaning weights and will produce more pounds of lamb per ewe than the Rambouillet. In addition the crossbreds and the Canadian Corriedales have a carcass conformation that is superior to that of the Rambouillet; and they will acquire a proper finish in the feed lots at lower weights. The Canadian Corriedales and the crossbreds produce a quality of wool that is more acceptable to Canadian manufacturers than the finer wool from the Rambouillet.

"Few detailed data are available for the Romney $\times$ Rambouillet project, but these sheep seem on the whole to be equal to or even slightly superior to the Canadian Corriedales."

Histochemical reactions of the placenta of the pig, G. B. WISLOCKI and E. W. DEMPSEY. (*Amer. Jour. Anat.*, 78 (1946), No. 2, pp. 181-225, illus. 29).—This paper concerns the cytology of the placenta of the pig as revealed by a study of nine uteri of pregnant sows and two from nongravid individuals.

Irradiation effects on genetic resistance of mice to mouse typhoid, J. W. GOWEN and M. R. ZELLE. (Iowa Expt. Sta.). (*Jour. Infect. Diseases*, 77 (1945), No. 2, pp. 85-91, illus. 1).—The investigation reported presents data on the effects of irradiating mice with X-rays and then determining the survival value of these mice to inoculations of the mouse typhoid organism, *Salmonella typhimurium* 11 C dose 200,000. The mice belonged to six different strains, each characterized by a specific genetic resistance to mouse typhoid.

The numbers of daughters necessary for progeny tests in the fowl, C. D. MUELLER and F. B. HUTT. (Cornell Univ.). (*Poultry Sci.*, 25 (1946), No. 3, pp. 246-255, illus. 3).—Analyses of the records of 86 sires, each of which had 50 daughters or more, showed that a little over 30 daughters were adequate for testing the viability of a sire's progeny when the mortality in the population ranged from 37 to 53 percent in the test period. With lower mortality a greater number of daughters is necessary for the differentiation of sires. For this purpose, a sample of thirty-odd daughters hatched in the last half of a 9-week breeding season was practically as useful (under the conditions of this experiment) as a similar sample from the first three hatches.

It is concluded that tests of dams for viability of offspring are less reliable than those of sires because the numbers of daughters available from single dams in one season are usually too small for differentiation of families. The number of daughters needed for tests of egg production is found to be much less than that required for tests of viability. Six daughters with com-

pleted records appear to be adequate for tests of dams for ability to transmit high fecundity.

The development and use of chicken inbreds, C. W. KNOX. (U. S. D. A.). (*Poultry Sci.*, 25 (1946), No. 3, pp. 262-272).—The first part of this paper deals with the development of inbreds and the second part with the use of inbred lines in crosses in an attempt to produce progeny of superior value to the commercial poultry farmer. The extensive data tabulated and discussed indicate that lines of inbreds may be produced without a decrease of fertility, hatchability, mature body weight, or annual egg production. Selection must be initiated and maintained during inbreeding in order to control the direction that homozygosity takes during inbreeding. Incrossbreds produced from inbred Rhode Island Reds mated to Single-Comb White Leghorns gave superior results in annual egg production to the standardbred Rhode Island Reds and White Leghorns in this experiment. Incrossing and topincrossing were not as favorable for annual egg production as incrossbreeding, but were improving with each successive year that the inbreds improved, namely the last 3 yr.

Relative influence of heredity and environment on fertility and hatchability in Wyandottes, S. S. MUNRO (*Empire Jour. Expt. Agr.*, 14 (1946), No. 53, pp. 25-30).—The author discusses the findings of Hutt (E. S. R., 83, p. 181) with reference to a relatively low hatching rate of White Wyandotte eggs in certain locations, and presents data to show that "under certain conditions, the exact nature of which is obscure, this breed will give excellent reproductive results. It is further evident that excellent and sustained records of high hatchability on the part of a flock or a strain at any one poultry plant cannot be regarded per se as proof of genetic superiority in reproductive ability. It likewise follows that the converse, i. e., continued poor hatchability on the part of a flock at a single location cannot be regarded as genetic inferiority without further evidence."

The work reported included an exchange of pullets in the fall of 1940 between Lacombe, Alta., a point of consistently poor hatchability, and Summerland, B. C., with consistently high hatchability. Data collected in 1942 at Lacombe showed "conclusively that the two strains do not differ when the environmental conditions are equalized."

The suggestion is made that low fertility may not actually be the fault of the male or of the sperm, but may sometimes result from infertilizable eggs, or from very early death of the embryo either before oviposition or while the eggs are being held for incubation, so that the incubated egg appears infertile on candling or when broken out for examination.

The effect of selection for shank length on sexual maturity and early egg weight in Single Comb White Leghorn pullets, I. M. LERNER. (Univ. Calif.). (*Poultry Sci.*, 25 (1946), No. 3, pp. 204-209).—Data on the interrelationships between body size, sexual maturity, and early egg weight in two lines of Leghorns primarily differing in shank length are presented. It is shown that selection for body size delayed sexual maturity and increased beginning egg weight. Within the line characterized by the smaller body size, age at sexual maturity and mean weight of the first 10 eggs show a significant net correlation, both being independent of body size. In the line with larger body size early egg weight is independent of maturity but is correlated with body size. The possible reasons for such difference between the two lines are discussed.

Rate of growth in progeny to ten weeks in relation to shank length of parents, M. A. JULL and E. W. GLAZENER. (Md. Expt. Sta.). (*Poultry Sci.*,

25 (1946), No. 3, pp. 256-261).—From the station flock of New Hampshires, two strains differing significantly in shank length at 10 weeks of age were developed by the original selection and progeny testing of parents differing in adult shank length. At this age a high positive correlation between body weight and shank length was demonstrated for both Barred Plymouth Rocks and New Hampshires. Variability in body weight was found to be from less than two to more than three times the variability in shank length. Variability in rate of growth was found to be relatively greatest at 4 weeks of age in females and at 4 to 6 weeks of age in males.

Since the two strains of New Hampshires differed significantly in body weight at 4 weeks of age, the most effective selection of birds for breeding purposes to effect differences in growth rates of progeny is thought to be on the basis of shank length and body weight at approximately this age.

Effects of thiouracil, desiccated thyroid, and stilbestrol derivatives on various glands, body weight, and dressing appearance in the chicken, E. W. GLAZENER and M. A. JULL. (Md. Expt. Sta.). (*Poultry Sci.*, 25 (1946), No. 3, pp. 236-241, illus. 2).—In feeding trials with a total of 280 chicks, including purebred and crossbred Barred Plymouth Rocks and New Hampshires, feeding thiouracil at the 0.1 percent and 0.2 percent levels in the mash during the growing period depressed growth, the 0.2 percent level more than the 0.1 percent. Thyroid enlargement was relatively greater in the females than in the males, indicating a sex difference. Although the testes size in the thiouracil and diethylstilbestrol lots varied a great deal, the testes tended to be smaller in these lots, particularly in the diethylstilbestrol birds, than in the controls. Combs were small and pale for both sexes in the thiouracil and diethylstilbestrol lots, whereas the combs in the desiccated thyroid lot were a bright red.

On the basis of dressing and fleshing appearance, the lot of birds fed diethylstilbestrol for a 3-week period at a level of approximately 30 mg. per day gave the best dressing appearance of any of the lots. Early limited feeding followed by full feeding for the last 3 weeks seemed to improve the dressing appearance of the carcasses. Dimethyl ether of diethylstilbestrol fed for a 2-week period at the level of 50 mg. per pound of feed did not appear to improve finish, affect appetite, or improve the weight of the birds over the controls under the conditions. Combs and wattles of both males and females became pale and shriveled in the treated lots.

Tasting tests indicated that the diethylstilbestrol and dimethyl ether of diethylstilbestrol-fed lots, particularly the females, were more highly flavored than the controls, although much individual variation in taste was evident.

Regulation in the chick allantois. E. ZWILLING. ([Conn.] Storrs Expt. Sta.). (*Jour. Expt. Zool.*, 101 (1946), No. 3, pp. 445-453, illus. 9).—It was found that removal of the remains of the primitive streak from 18-25 somite chick embryos does not interfere with tail formation. Excision of the first formed posterior gut diverticulum (allantoic diverticulum) results in either entire absence of the allantois or the formation of small, usually atypical allantoides. The underdeveloped and multiple allantoic structures which are found are explained as the result of a regulation of remnants of the allantoic epithelium. This operation does not interfere with the formation of the caudal intestine.

The inheritance of egg production and hatchability in turkeys, W. O. WILSON and L. E. JOHNSON. (S. Dak. Expt. Sta.). (*Poultry Sci.*, 25 (1946), No. 3, pp. 278-284, illus. 4).—Data on Bronze and Beltsville Small White turkeys in four different flocks were analyzed for heritability of egg produc-

tion and of egg hatchability. A total of 229 dams and 514 daughters was included.

The heritability of egg production and egg hatchability was not significantly different in the two varieties studied. Expressed on the basis of the first season's production records, the heritability of individual differences was +0.02 for egg production and +0.26 for hatchability. The intrayear, intra-flock correlation between egg production and egg hatchability was +0.08.

Inheritance of hessian fly resistance derived from W38 and durum P. I. 94587, R. M. CALDWELL, W. B. CARTWRIGHT, and L. E. COMPTON. (Ind. Expt. Sta. coop. U. S. D. A.). (*Jour. Amer. Soc. Agron.*, 38 (1946), No. 5, pp. 398-409, illus. 2).—The authors present data on the inheritance of hessian fly resistance in the F_1 , F_2 , and F_3 of crosses of W38, C. I. 1261 (resistant), with Wabash, Fultz sel.-Hungarian selections, and Dawson (susceptible). The resistant W38 was shown to differ from the susceptible wheats studied by a single gene pair governing resistance. In the field, resistance tended to be dominant; in the greenhouse, it was usually recessive. The symbols $H_3 H_3$ are proposed to designate the incompletely dominant gene pair controlling hessian fly resistance in W38, and $h_3 h_3$ the allelomorphic gene pair occurring in the susceptible Wabash, Dawson, and Fultz-Hungarian selections. Resistance derived from W38 and its hybrid progenies is shown to have two expressions in resistant genotypes, viz, (1) the capacity under favorable conditions to suppress development of the fly larvae, with resultant normal plant growth, and (2) the capacity to grow almost normally and not to exhibit stunting under the conditions that prevent the full development of resistance and thus permit infestation. The second capacity was invariably associated with the first and may be used as a criterion of the presence of the $H_3 H_3$ factor pair under greenhouse or high-temperature conditions. Limited data suggest that the hessian fly-resistant durum P. I. 94587 differs from the susceptible vulgare wheats Gladden and C. I. 11850 by at least two dominant genes governing fly resistance.

FIELD CROPS

High altitude forage investigations in southwestern Colorado, D. KOONCE (*Colorado Sta. Bul.* 490 (1946), pp. 19+, illus. 4).—Forage crops experiments were conducted at the Fort Lewis substation 1937-44 under dry land and irrigation. Ladak surpassed other alfalfa varieties in average acre yield. Alfalfa averaged 3.98 tons of hay per acre under irrigation, alfalfa-grass mixture 3.91 tons, and all grass plots 0.54 tons. Seeding alfalfa at rates of 5 and 10 lb. per acre gave practically the same yields of hay 1938-44. Under irrigation, reed canary grass and crested wheatgrass were inferior to bromegrass and orchard grass in the alfalfa-grass mixtures. Three irrigations of 6 acre-inches each, if applications were so delayed that the first cutting would receive one irrigation and the second cutting two, would produce good yields of hay without increasing the amount of water used. Stand, survival, and yield of alfalfa, bromegrass, and crested wheatgrass in a non-irrigated forage and grazing test on bench land clearly indicated their importance in such pasture plantings. Animal preference in grazing and the amount of forage left slightly grazed showed that alfalfa, bromegrass, and orchard grass were more palatable than crested wheatgrass or western wheatgrass. The mixture suggested by the results for planting on non-irrigated land, with conditions similar to those at Fort Lewis, includes alfalfa, 2 to 3 lb. per acre, bromegrass 6 to 8 lb., and crested wheatgrass 5 to 7 lb.

Judging mountain meadow range condition in eastern Oregon and eastern Washington. E. H. REID and G. D. PICKFORD (*U. S. Dept. Agr. Cir. 748* (1946), pp. 31, illus. 18).—The general guides outlined by which the condition of mountain meadows can be judged, and tentative standards for determining proper utilization of mountain-meadow vegetation, are intended for those who use or manage summer range and who have such meadows in these and other western States. Proper management of mountain meadows and its benefits are treated in some detail.

Dry-land pasture experiments at the Central Mountain Branch Station, Moccasin, Montana. R. M. WILLIAMS and A. H. POST. (Coop. U. S. D. A.). (*Montana Sta. Bul. 431* (1945), p. 31, illus. 14).—Superseding Bulletin 388 (E. S. R., 85, p. 473), this publication includes three additional years of grazing data, but the final results and recommendations on the comparable value of standard crested wheatgrass, native grass, and smooth brome grass for pasture purposes remain practically the same.

Length of life of roots of ten species of perennial range and pasture grasses. J. E. WEAVER and E. ZINK. (Univ. Nebr.). (*Plant Physiol.*, 21 (1946), No. 2, pp. 201–217, illus. 6).—Seeds of these 10 grasses were planted in loam soil in containers large enough for ample root development. Small bands of very thin pliable sheet tin were placed around individual roots at each of two developmental stages of the plant, 3,424 roots of 181 plants being thus banded to ascertain their longevity. Of the banded roots of crested wheatgrass, 97 percent survived the first summer and 75 percent the first year. Survival on Hungarian brome grass was 92, 84, and 36 percent at three examinations; that on switchgrass and western wheatgrass was—after the second summer—100 and 42 percent. After three growing seasons, 81 percent of the roots on big bluestem survived, but none on nodding wild-rye. Losses in all species were gradual, and after three growing seasons survival of roots was for blue grama 45 percent, side-oats grama 14, and little bluestem and needlegrass 10 percent each.

The average number of roots produced by individual plants varied from 175 to 882 at the end of the third summer; compared with the total number, losses among the banded roots were small to negligible, often amounting to only 2 to 8 percent of the total number of living roots. Nearly all the species studied have a long life and exhibit great permanency of occupation—both important factors for preventing erosion. Roots of 6 species of unknown age were banded in clay loam soil in prairie; at the end of the second growing season the loss ranged from 23 to 45 percent each, except for needlegrass where it was 57 percent. Established seedlings of Hungarian brome and crested wheatgrass with banded roots were clipped at a 2-in. height and at 10-day intervals; there was no loss from unclipped controls of the first species and only 3 percent from the second, but roots of the clipped brome grass suffered a loss of 15 percent and those of the wheatgrass 73. New roots from vigorous transplanted blocks of sod of big and little bluestem grasses were banded and the tops of one lot of each were clipped at intervals of 10 to 14 days; after five clippings root losses were 45 and 64 percent, whereas the unclipped controls lost only 3 percent each.

New alfalfa varieties resist wilt. H. L. THOMAS (*Minn. Farm and Home Sci. [Minnesota Sta.]*, 3 (1946), No. 3, p. 11, illus. 1).—Ladak and Ranger are recommended for Minnesota because they have proved much superior to the old standard Grimm wherever bacterial wilt is a factor in depleting yields and stands.

Blackeye beans in California, W. W. MACKIE (*California Sta. Bul. 696* (1946), pp. 56, illus. 25).—The Blackeye, a cowpea of African origin with definite adaptation and edible qualities, more closely resembles the bean than any other legume. After becoming established in the Southern States, it spread to California where it was found well suited to the warmer irrigated areas and, to a lesser extent, to dry-farmed areas. Climatic conditions restricting common beans and lima beans do not apply equally to Blackeyes. Large areas in the San Joaquin and Sacramento valleys and in similar regions are well adapted to Blackeyes.

Methods of soil preparation, irrigation, cultivation, and harvesting—discussed in detail—are similar to those of other bean crops. Crop rotations with Blackeyes are more widespread and satisfactory than with other beans. Nodulation in Blackeyes is easily established and becomes permanent, although requiring a different culture from beans. Because of rainless summers, however, California almost exclusively holds the market for Blackeyes, limited almost entirely to the Southern States. Attacks of fungus and bacterial diseases and nematode and insect pests on the Blackeye have been largely met by the creation of disease-resistant varieties or by improving cultural practices under favorable weather conditions. Information on the price, production, and marketing of Blackeye beans and their uses and cooking practices is included, together with an extensive bibliography.

Comparative development of some United States, Mexican, and Central American corns at different latitudes and altitudes, I. E. MELHUS, G. SEMENIUK, J. R. WALLIN, G. M. WATKINS, and G. J. GOODMAN. (Iowa Expt. Sta.). (*Amer. Jour. Bot.*, 33 (1946), No. 3, pp. 220–221).—An abstract.

Illinois hybrid corn tests, 1945, G. H. DUNGAN, J. H. BIGGER, A. L. LANG, B. KOEHLER, and R. W. JUGENHEIMER. (Coop. Ill. Nat. Hist. Survey). (*Illinois Sta. Bul. 517* (1946), pp. 225–256, illus. 1).—Yields per acre and other agronomic characters are reported for 270 corn hybrids grown in 1945 on seven fields and 9 again grown on soils of two fertility levels. Sullivan test field again had the highest average yield, 91.7 bu. per acre. The fields averaged 60.1 bu. per acre compared with 46.5 bu., the State average. The 9 double-cross hybrids on the same farm at Urbana averaged 112.9 bu. per acre on highly productive soil and 66.3 bu. on medium-productive soil. White hybrids on southern fields performed relatively better than the whites on the northern and north-central fields. Lodging of corn was especially severe at Galesburg, mainly due to unfavorable weather; at Sheldon, insect damage (southern corn rootworm) and unfavorable weather; and at Alhambra, extremely late planting. The greatest amount of stalk breakage ascribable to damage by the European corn borer occurred at Sheldon. Losses from ear rots caused by *Diplodia* were low, but damage from *Nigrospora* was higher than usual. Seed of 18 hybrids treated with an organic sulfur compound yielded 8.7 bu. over untreated seed. Damage from kernel rot in these hybrids ranged from 1.18 to 5.84 percent.

Cotton variety tests in Georgia, 1942–45, W. W. BALLARD, A. L. SMITH, and R. P. BLEDSOE. (Coop. U. S. D. A.). (*Georgia Sta. Cir. 149* (1946), pp. 8).—Empire, Coker 200, Coker 100 Wilt, and Coker 4 in 1 were high in money value and with Hibred led in acre yields in north Georgia tests 1942–45. Empire strains and the above Coker strains also led in the 1945 tests. Coker 100 Wilt and Stonewilt led commercial varieties in yield and money value in south Georgia tests 1943–45. Lines of CSS 3720 surpassed other varieties in 1945 tests, and the wilt-resistant Empire 2910 outyielded other commercial varieties.

Descriptions of and key to American potato varieties. C. F. CLARK and P. M. LOMBARD (*U. S. Dept. Agr. Cir. 741 (1946), pp. 50, about 80 illus.*)—Potato varieties grown currently in the United States are discussed, and data for use in their identification are presented. Detailed descriptions based on plant, flower, tuber, and sprout characters are given for 39 varieties which are principally survivors of the many that originated in this country, largely during the second half of the nineteenth century, new varieties produced in the National potato-breeding program, and a few varieties from foreign sources. Their origin, seed stock production, and disease resistance are discussed, and a systematic key to the varieties is included. The main characteristics and present distribution of 14 less important varieties which are about to become extinct or have disappeared from commercial production but are still grown locally for home consumption are also given. There are 42 literature citations.

Origin of the first European potatoes and their reaction to length of day. J. E. VAN DER PLANK (*Nature [London], 157 (1946), No. 3990, pp. 503-505.*)—There are two centers from which potatoes might have come, viz, the Chiloé region of southern Chile and the Andes at tropical latitudes. The evidence presented from various sources (9 references) is believed "entirely consistent in showing that the first European potatoes were grown in short days, that they were in fact short-day varieties, and that short-day varieties persisted not just for a short while but for centuries." The Chilean varieties are generally regarded as long-day in reaction, and the evidence of photoperiodism is against the theory that European potatoes came from Chile. A brief discussion of the nomenclature is included.

Origin of the first European potatoes and their reaction to length of day. J. G. HAWKES and C. M. DRIVER (*Nature [London], 157 (1946), No. 3992, p. 591.*)—A comment on the authors' studies in relation to the above paper by van der Plank.

Soybean varieties and dates of planting in the Yazoo-Mississippi Delta. P. R. HENSON and R. S. CARR. (Coop. U. S. D. A.). (*Mississippi Sta. Bul. 428 (1946), pp. 12.*)—Variety tests 1944-45 at several localities in the Delta showed C101 and S100 to lead early maturing strains, Ogden the medium maturing, Volstate and Roanoke the medium-late maturing, and Mamloxi and Mamotan the late-maturing strains. Date of planting tests showed that soybeans may be planted from early April to early June with equally good results, and this long planting period should enable Delta farmers to fit soybeans readily into their planting schedules. The optimum combining period of the Ogden variety of soybeans can also be increased by early and late plantings.

Preliminary observations on some effects of artificial defoliation of wheat plants. R. M. WHITE (*Sci. Agr., 26 (1946), No. 5, pp. 225-229, illus. 1.*)—Grasshoppers are among the most widespread and persistent pests of cereals on the Canadian prairies; it is not uncommon for newly hatched hoppers to devour all the leaves of young plants. The question as to what effect this leaf removal actually has on the ultimate yield or quality of the grain led to this investigation, from which it was found that defoliation of the wheat plant—at any stage of development—did not necessarily result in crop failure. The yield suffered most when this occurred during the heading to dough stages; defoliation during the 2 weeks previous to maturity was not injurious to the plant insofar as yield was concerned. Defoliation of the growing plant affected the quantity and weight of the grain per bushel but not its quality.

Better wheat for New York, H. H. LOVE and W. T. CRAIG. (Coop. U. S. D. A.). ([*New York*] *Cornell Sta. Bul.* 828 (1946), pp. 27, illus. 11).—Features of the program of wheat improvement aimed at the production of varieties high in yield and possessing winter hardiness, stiffness of straw, and resistance to disease, as well as the quality desired for particular purposes and their importance in the improvement program, are considered briefly. New varieties developed and introduced to the growers include Yorkwin (Dietz $\times$ Goldcoin), Nured (Forward $\times$ Dietz), Cornell 595—[(Howard $\times$ Forward) $\times$ Nured] $\times$ Honor and Valprize (Valley $\times$ Grandprize).

Seeding tests suggested about September 15 and on certain fields somewhat earlier for better yields. Data 1930-43 indicated that about 10 mo. are needed to produce a crop of winter wheat. Experiments over a number of years with spring grains show that spring wheat does not compare satisfactorily with winter wheat where the latter can be grown, and that oats and barley usually give better results.

Seed inspection, F. A. McLAUGHLIN (*Massachusetts Sta. Control Ser. Bul.* 127 (1945), pp. 40).—Purity, weed seed contents, and germination percentages are reported for official samples of seed of field crops and seed mixtures and germination for samples of vegetable seed collected in Massachusetts during the year ended November 1, 1945. Reports are also made on field tests for trueness to type and variety on lots of beans, beets, carrots, corn, and spinach, in conjunction with G. B. Snyder; and on germination and performance tests of flower seeds, by C. L. Thayer and E. B. Risley.

Weed investigations, C. A. BROWN and W. H. CARTER (*Louisiana Sta. Bul.* 402 (1946), pp. 24, illus. 7).—Characteristics and distribution of alligatorweed (*Alternanthera philoxeroides*) are described, and the progress of experiments on the control of this and other weeds by chemical and hormone herbicides and alligatorweed by farm machinery, including burners, is reported on. A high percentage of the alligatorweed plants was killed in tests with 2,4-D, and most of the plants were so weakened that they recovered slowly. While eradication was not obtained, the results seemed promising. Many other weeds, including nutgrass, cocklebur, ragweeds, rosebriar, water-hyacinth, and the rice weeds indigo, redweed, mule-ear, and several sedges were also killed by 2,4-D or at least weakened.

Destroying lawn weeds with 2,4-D, G. H. AHLGREN and H. R. COX (*New Jersey Stas. Bul.* 725 (1946), pp. 11, illus. 4).—Tests with 2,4-D during the spring, summer, and fall of 1945, including comparisons of the relative effectiveness of ammonium and sodium salts of 2,4-D and of 2,4-D dissolved in carbowax, were made on all of the common lawn weeds and on some of lesser significance. Concentrations ranging from 0.14 to 0.56 percent of 2,4-D were applied, and effects on weeds and on lawn grasses are reported. Such broad-leaved turf weeds as dandelions and buckhorn could be destroyed easily by spraying with 2,4-D. Dandelions and buckhorn were successfully eliminated by spring, midsummer, and fall applications of 2,4-D, concentrations of 0.14 percent 2,4-D being adequate. Heavier concentrations were needed to destroy certain other weeds. The 2,4-D destroyed weeds more slowly in cool weather than during hotter periods. A spreader or wetting agent applied with the 2,4-D increased the ease with which more resistant waxy-leaved plants, as red sorrel or clover, can be destroyed. Kentucky bluegrass was more resistant to 2,4-D than is Chewing's fescue or Colonial bentgrass, although all of these grasses, cut at lawn-mower heights, withstood applications of 2,4-D as concentrated as 0.56 percent, which likewise had no herbicidal effect on crabgrass. Lawns and other turfed areas where crab-

grass exists should be treated to destroy the broad-leaved weeds in late August or September, which will prevent increased infestation by crabgrass. After treatment to eliminate the weeds, the area should be fertilized and reseeded. Minimum injury to clover resulted from use of a dilute concentration of 2,4-D and one containing no wetting agent. Certain weeds, as spotted spurge, were not destroyed by 2,4-D. Susceptible weeds were completely destroyed in 10 days to 3 weeks.

Dandelion control with 2,4-dichlorophenoxyacetic acid (2,4-D), D. KLINGMAN (*Wyoming Sta. Bul.* 274 (1946), pp. 12, illus. 3).—The tests reported indicated that dandelion could be eradicated almost completely by 2,4-D spray without harm to bluegrass, although white clover might be injured. Best results have been obtained where conditions favor rapid growth of grass, i. e., when daily temperatures average about 60°F. Home-made preparation gave good results by dissolving in water at a concentration of 1 part 2,4-D to 1,000 parts of water by weight (1/10 of 1 percent).

Controlled grazing eradicates bindweed, L. M. STAHLER and A. E. CARLSON. (Coop. U. S. D. A.). (*Minn. Farm. and Home Sci. [Minnesota Sta.]*, 3 (1946), No. 3, pp. 12-13, illus. 2).—Controlled grazing by sheep can consistently eradicate bad stands of field bindweed in 2 yr. or less, according to results obtained in experiments at the Lamberton station. The routine found best is to plow the infested field and seed rye or winter wheat September 15; begin pasturing as soon as the grain has a good start and pasture until June 30; plow and seed immediately to Sudan grass which can be grazed until September 15, when the first-year routine is repeated. A project at Underwood for control of leafy spurge by grazing definitely established that spurge is highly palatable and nonpoisonous to sheep, which prefer the young stems and blooming heads to legumes and grasses. The flock also made normal gains on a bluegrass-leafy spurge mixture. Controlled grazing of bluegrass pasture heavily infested with leafy spurge reduced stands of spurge 54 percent the first year and 85 percent in 2 yr. Vigor of remaining plants was greatly reduced.

HORTICULTURE

A vegetable gardener's handbook on insects and diseases, W. H. WHITE and S. P. DOOLITTLE (*U. S. Dept. Agr., Misc. Pub.* 605 (1946), p. 30+, about 70 illus.).—This revision of an earlier publication (*E. S. R.*, 90, p. 804) presents in a like manner general information on the important disease and insect pests of cultivated vegetables with information on control. Suggestions are given on the preparation of sprays and dusts, poisoned baits, etc., and on essential equipment.

Savory herbs: Culture and use, M. S. LOWMAN and M. BIRDSEYE (*U. S. Dept. Agr. Farmers' Bul.* 1977 (1946), pp. 33+, illus. 17).—General information is presented on the nature, growing, and utilization of various plants whose leaves, roots, flowers, or seeds are used for garnishing or flavoring. Included are such plants as anise, dill, parsley, chive, fennel, mint, sage, and thyme.

USDA-34: A tropical sweet corn, R. E. HARPER (*U. S. Dept. Agr., Agr. in Americas*, 7 (1946), No. 4, pp. 74-75, illus. 1).—Sweet corn varieties grown commonly in continental United States were found unadaptable to Puerto Rico due to differences in day length as well as susceptibility to plant disease.

This article discusses the development by the Puerto Rico Federal Experiment Station of USDA-34 sweet corn, a variety comparing favorably in

quality with continental varieties and resistant to several serious disease and insect pests. USDA-34 has become widely distributed in southern latitudes, including Hawaii, Latin American countries, and certain southern States.

The effect of various ions on guttation of the tomato, G. J. RALEIGH. (Cornell Univ.). (*Plant Physiol.*, 21 (1946), No. 2, pp. 194-200).—Bonny Best tomato plants grown in complete nutrient solutions until they had attained an approximate height of 130 cm. were then transferred to solutions lacking in one nutrient element such as N, P, K, Ca, or Mg. When deficiency symptoms became apparent, the plants were removed from the greenhouse to a humid underground chamber maintained at a temperature of 68° to 74°F. and the deficient elements were added to their respective cultures. The addition of nitrates to a N-deficient solution resulted in a marked guttation. Presumably the supplying of nitrate to such plants caused an increase in respiration. Plants supplied nitrate guttated profusely in a shorter time than did those supplied ammonium N, suggesting that the nitrate may have also provided oxygen. Marked guttation occurred also in the plants supplied P or K. Guttation did not occur in the plants in deficient solutions or in those supplied with Ca or Mg.

Hybrid tomatoes give superior yields, T. M. CURRENCE (*Minn. Farm and Home Sci. [Minnesota Sta.]*, 3 (1946), No. 3, pp. 4-5, illus. 2).—The author points out the possibilities of increased production, both early and total, of certain varietal combinations over ordinary commercial kinds. The chief limitation to date has been the painstaking and tedious procedures required in emasculation of blooms. However, some progress has been made in the development of varieties which, because of a structural variation, do not self-pollinate readily. Progress is reported in the selection of parental varieties that offer possibilities in hybrid seed production.

"Frost line" orcharding risky business; elevation and air drainage essential, W. S. CLARKE, JR. (*Pennsylvania Sta. Bul.* 475 (1946), Sup. 1, pp. 9-10, illus. 3).—Presenting information on frost damage to the station and nearby orchards in the spring of 1945, the author discusses various factors such as elevation, slope, air drainage, etc., that are involved in frost injury or its prevention. The selection of sites is considered so important that prospective planters of fruit trees are urged to study their locations carefully.

The organic acids of grapefruit juice, W. B. SINCLAIR and D. M. ENY. (Calif. Citrus Expt. Sta.). (*Plant Physiol.*, 21 (1946), No. 2, pp. 140-147, illus. 1).—The organic acids of grapefruit were found to be citric and malic acids, and the total acid content precipitated from grapefruit juice by lead acetate was equal to the sum of these acids. The titration curve of grapefruit juice was very similar to that of a pure citric acid solution, provided a correction is made for the combined acid occurring naturally in the juice. There was a definite relation between the pH and the amount of acid in the salt or combined form.

The free acids decreased and the pH of the juice increased with increase in size of fruits. The decrease in free acid concentration associated with enlargement is due chiefly to increased fruit size rather than any change in the absolute amount of free acid per fruit.

The alkalinity of the ash is a measure of the base-forming capacity of the juice as well as a measure of the cations combined with the organic acids. In grapefruit juice more than 50 percent of the total cations are utilized in the formation of organic acid salts, as compared to more than 70 percent in the juice of Valencia and navel oranges. A large increase in available

cations from soil fertilization would produce a limited increase in combined acid and little decrease in juice acidity.

Chile's expanding citrus industry, P. L. GUEST and G. ROSENBERG (*U. S. Dept. Agr., Agr. in Americas*, 6 (1946), No. 6-7, pp. 98-100, 107, illus. 4).—A comprehensive discussion is presented of the extent, present status, cultural practices, and methods of harvesting and marketing. Citrus is grown over a north-south air line distance of more than 1,300 miles. At present production is confined largely to oranges and lemons, with 58 per cent of the total in lemons.

Dominican coffee, R. P. STOVALL (*U. S. Dept. Agr., Agr. in Americas*, 6 (1946), No. 5, pp. 87-89, 90, illus. 3).—Introduced in the early part of the eighteenth century, coffee is now one of the most important commodities produced in the Dominican Republic. Information is presented on location of the plantations, methods of culture, habits of growth, harvesting, marketing and official regulations, etc.

Effects of potassium on the nitrogenous constituents of *Ananas comosus* (L.) Merr, C. P. SIDERIS and H. Y. YOUNG. (Pineapple Res. Inst. Hawaii). (*Plant Physiol.*, 21 (1946), No. 2, pp. 218-232, illus. 1).—Determination of the nitrogenous fractions in the tissues of pineapple plants supplied with equal amounts of N either as nitrate or ammonium, but on sharply contrasted K levels, showed that K supply affected N uptake. Nitrate N, as indicated in the basal leaf and stem sections, was greater in the high than in the low K cultures in the nitrate series. Ammonium N, generated possibly by deaminizing processes, occurred in traces in the plants of both nitrate and ammonium series. Ammonium absorbed from nutrient solutions was readily converted into compounds of greater complexity in the roots, and it is considered doubtful if any passed from roots to stem unchanged.

Soluble organic N calculated as milligrams per gram of fresh weight was higher in the low K than high K cultures of the nitrate series, but when calculated as total soluble organic N per plant the values were reversed. Protein N in the leaves calculated as milligrams per gram of tissue was greater in the low K than high K cultures, but in the stem these values were reversed.

The physiological function of K in the conversion of the soluble organic N fractions to protein N in high K cultures was more noticeable in the stem than in the leaves, where protein N was higher in the low than high K series.

The home lawn, H. L. LANTZ, L. C. GROVE, and E. P. SYLVESTER (*Iowa Sta. Bul. P80* (1946), pp. 645-664, illus. 6).—Directions are given on building a new lawn by soil drainage and fertilization, seedbed preparation, and correct seeding; and caring for an established lawn by fertilizing, liming, rolling, mowing, watering, and control of earthworms, ants, and other insects. The recommendations on weed control deal with 2,4-D, weeds killed by 2,4-D compounds, how and when to spray them, effects on white clover, and precautions in using 2,4-D sprays.

Planting and caring for the lawn, G. H. AHLGREN (*New Jersey Stat. Bul. 724* (1946), p. 32, illus. about 30).—General information is presented on the preparation of the soil, fertilizing, seeding, management of new and established lawns, weeding, watering, control of insect and other pests, etc.

FORESTRY

The southern hardwoods (*Memphis: South. Hardwood Prod.*, [n. d.], pp. 46+, illus. 20).—Information is presented on the distribution, growth, wood, and uses of various species of hardwoods growing in southern forests.

DISEASES OF PLANTS

Outstanding diseases of agricultural crops and uses of fungicides in the United States. S. E. A. MCCALLAN (*Contrib. Boyce Thompson Inst.*, 14 (1946), No. 3, pp. 105-115).—"A tentative method is presented for determining the importance of the disease loss on an over-all or national basis. An index is obtained from the product of the logarithm of the estimated annual percent loss . . . and the logarithm of the farm value expressed in units of \$100,000. A table is given of the 50 leading agricultural crops of the United States together with the farm value, acreage and farm value per acre, as well as the 5 leading States. The 36 outstanding diseases obtained by the above procedure are recorded, together with average annual loss, 10-yr. range in fluctuation, and present major control measures. Tables are also presented showing the estimated annual consumption of fungicides by chemicals and by crops and diseases. From this the more outstanding potential uses may be seen for new or improved fungicides, and hence the diseases for which it is desirable to develop test methods. Among the outstanding diseases where need for better fungicides are indicated are: (1) Seed treatments—corn and cotton seedling blights and oat smuts, [and] (2) sprays and dusts—apple scab, potato tip burn and late blight, peach and cherry brown rot, pear blight, peanut leaf spot, and tomato blights. More or less adequate laboratory or greenhouse methods for fungicide evaluation are available in certain of the cases cited, while development and standardization is necessary for most other important diseases."

Some features of the spread of plant diseases by air-borne and insect-borne inoculum. E. E. WILSON and G. A. BAKER. (Univ. Calif.). (*Phytopathology*, 36 (1946), No. 6, pp. 418-432, illus. 5).—Numerical data on the spread of diseases from infection to above-ground parts of nearby susceptible plants were compiled from the literature, and the rate at which the incidence diminished with increasing distance from the source of inoculum was examined. The diseases were of three categories with respect to mode of dissemination, viz, (1) fungus diseases spread by air-borne spores, (2) a bacterial disease spread by wind-blown rain, and (3) virus and fungus diseases spread by insect vectors. In each case the lowering in incidence of infection at increasing distances from the source was described to a fair degree of accuracy by an equation of the form $y = 100(1 + a)^2 / (x + a)^2$, where y is the incidence of infection at x_2 and subsequent distance intervals expressed as a percentage of the incidence at x_1 , or first distance interval. The quantity a depends on the conditions under which spore dissemination occurs as well as upon the location of x_1 with respect to distance from the source. The results from use of this equation compared favorably with those from equations deduced by more complicated methods drawn from the literature.

Aerobiology in relation to plant disease. E. C. STAKMAN and C. M. CHRISTENSEN. (Minn. Expt. Sta.). (*Bot. Rev.*, 12 (1946), No. 4, pp. 205-253).—This critical review (151 references) considers the subject under adaptation of fungi to aerial dissemination; quantities of spores and devices facilitating their production; spore wastage; liberation of spores; spore size; altitudes reached by spores and the rate of fall and theoretical dispersal distance; local dissemination of fungi; long-distance dissemination; stem rust of wheat (discussed in great detail); rusts of oats and leaf rusts of wheat in the United States; cereal rusts in Europe, North Africa, and India; the distance to which viable spores can be carried by winds; and dissemination of physiologic races of plant pathogens. "Even where a disease, as such, may

persist in a certain region from year to year independently of wind-borne spores from another region, as late blight of potatoes in New England or wheat stem rust in some of the Northern States where barberries still are present, interregional wind dissemination of certain virulent physiologic races may still play a very important part in epidemiology. More precise evidence of this has been accumulated with certain of the cereal rusts than with other plant pathogens, but the principle very probably applies to other plant pathogens also."

Nuclear cycle and life history of a new species of *Doassansia* (Ustilaginales). M. J. THIRUMALACHAR (*Lloydia*, 9 (1946), No. 1, pp. 24-30, illus. 12).—The new species of smut fungus—*D. hygrophilae*—described was found parasitizing the leaves of *Hygrophila* sp. in India.

Manganese toxicity affecting crops on acid soils. J. B. HALE and S. G. HEINTZE (*Nature [London]*, 157 (1946), No. 3991, p. 554).—During the past 5 yr. the authors have investigated some 25 cases of damage to field crops which have proved on analysis to be associated with a very high concentration of Mn in the leaves; soil analyses always revealed a very low pH and a high concentration of exchangeable Mn. The evidence available seems to confirm the view that in acid soils Mn toxicity is an important factor in causing injury to plant growth. Ca deficiency may occur on some acid soils, but in only one of these cases of excess Mn was there indication of such a condition.

Detection of manganese deficiency in plants by tissue tests, using tetramethyldiaminodiphenylmethane. D. J. D. NICHOLAS (*Nature [London]*, 157 (1946), No. 3995, p. 696).—The above reagent was successfully used in detecting traces of Mn in plant tissue extracts; the detailed procedure is given.

Nickel and multiple trace element deficiencies in agricultural crops. W. A. ROACH and C. BARCLAY (*Nature [London]*, 157 (1946), No. 3995, p. 696).—In studies of mineral deficiencies, the yields of wheat, potatoes, and broad-beans sprayed with solutions containing compounds of Mn, Fe, B, Cu, Zn, and Ni, respectively, were all increased. This is believed to be the first indication that Ni is important in increasing crop yields and also the first record of Zn deficiency in the British Isles.

Glyoxalidine derivatives as foliage fungicides, I, II (*Contrib. Boyce Thompson Inst.*, 14 (1946), No. 3, pp. 151-171, illus. 4).—The following two papers are included:

I. *Laboratory studies*, R. H. Wellman and S. E. A. McCallan (pp. 151-160).—Since—in laboratory tests—they combine high fungistatic action with low toxicity to plants, 2-heptadecyl-, 1-hydroxyethyl-2-heptadecyl-, and 1-aminoethyl-2-heptadecylglyoxalidine or imidazoline show considerable promise as foliage fungicides. In slide-germination tests, maximum fungistatic action was achieved with glyoxalidine derivatives having a straight chain substituent containing 13 to 17 C atoms in the 2-position. Addition of lead arsenate or summer oil in proportions used in the field did not interfere with the fungistatic action. Maximum phytotoxicity in the greenhouse was reached with the 11 to 13 C atom derivatives. The ratio of highest concentration giving no plant injury to the LD50 value for 1-hydroxyethyl-2-undecylglyoxalidine was 13.5 and for 1-hydroxyethyl-2-heptadecylglyoxalidine 1,450. Side-chain unsaturation increased the phytotoxicity as did increasing length of chain in the 1-position. In the greenhouse, these materials were injurious to tomatoes at concentrations which would not control late blight but were moderately effective against snapdragon rust without phytotoxicity. There are 16 references,

II. *Field studies*, H. W. Thurston, Jr., J. B. Harry, F. H. Lewis, A. B. Groves, and C. F. Taylor (pp. 161-171) (Pa., W. Va., and Va. Expt. Stas. et al.).—Three derivatives, 1-hydroxyethyl-2-heptadecylglyoxalidine (No. 337), 2-heptadecylglyoxalidine (No. 341), and 1-aminoethyl-2-heptadecylglyoxalidine (No. 630)—investigated in the laboratory—have been tested in the field during several years against black spot of rose, apple scab and rust, potato late blight, and cherry leaf spot. On roses (1 year's test) 2-heptadecylglyoxalidine at 3 lb. per 100 gal. gave black spot control equivalent to bordeaux with wetting agent, and with less conspicuous deposit; 1-hydroxyethyl-2-heptadecylglyoxalidine was less effective and somewhat injurious. In 5-yr. tests in Pennsylvania on McIntosh and Stayman apples, 1-hydroxyethyl-2-heptadecylglyoxalidine and 2-heptadecylglyoxalidine at 1 lb. and 1-aminoethyl-2-heptadecylglyoxalidine at 3 lb. per 100 gal. controlled apple scab equivalent to standard lime-sulfur and much better than Fermate at 3 lb.; 1-hydroxyethyl-2-heptadecylglyoxalidine caused some foliage injury at 3 lb. per 100 gal. 2-Heptadecylglyoxalidine at 1 lb. per 100 gal. produced consistently better appearing foliage with greater area per fruit spur than standard lime-sulfur and had a marked residual effect on control of scab on the leaves. The glyoxalidine derivatives had much steeper dosage response slopes than Fermate in the field. Against cedar-apple rust, 2-heptadecylglyoxalidine was fairly effective but not equal to Fermate. 2-Heptadecylglyoxalidine was compatible with acid lead arsenate, nicotine sulfate, excess hydrated lime, and summer oil. In accordance with the laboratory results, these glyoxalidine derivatives caused potato leaf injury and failed to control late blight. In 4-yr. tests in Pennsylvania and Virginia and 2-yr. tests in West Virginia, 2-heptadecylglyoxalidine on Montmorency sour cherries at 1 lb. per 100 gal. was the most effective compound tested for control of leaf spot defoliation; there was little or no leaf injury and no dwarfing of fruit.

Polymeric organic polysulfides as fungicides and spray adjuvants, W. D. STEWART and J. H. STANDEN (*Contrib. Boyce Thompson Inst.*, 14 (1946), No. 3, pp. 203-220, illus. 3).—Polymeric organic polysulfides of high molecular weight can be made as stable finely divided aqueous dispersions with a range in particle size of 1μ to 4μ ; these are especially suitable for use as spray materials. Sprayed on plants, these latices dehydrate to form rubbery nonphytotoxic films insoluble in water and oil and of unusual tenacity and resistance to weathering. On admixing with other spray materials tenacity and resistance to weathering are imparted to the spray deposit. The polymers were evaluated as fungicides by standard laboratory procedures against *Sclerotinia fructicola* and *Alternaria solani*, polymeric organic polysulfides proving fungicidal. Toxicity to fungi increased with increase in the S content of the polymer. Activity was associated with the solid or polymer phase of the latices; the aqueous phase was almost nontoxic. Polyethylene pentasulfides are considered the most feasible for commercial use. Latices of these polymers were field-tested in 1945 with modern high-pressure spray equipment. The polymers were more effective at 2 lb. per 100 gal. as protective sprays against apple scab than micronized sulfur at 10 lb. per 100 gal. under conditions of high and frequent rainfall. Latices of this polymer applied in mixed sprays enhanced the activity of toxicants. The build-up of spray deposits was rapid even with high and frequent rainfall, but the physical compatibility with standard fungicides and insecticides—oil included—was excellent.

Seed and seedling infection of barley, brome grass, and wheat by *Xanthomonas translucens* var. *cerealis*, J. R. WALLIN. (Iowa Expt. Sta.). (*Phyto*.

pathology, 36 (1946), No. 6, pp. 446-457, illus. 4).—Seed and seedling infection of barley, bromegrass, and wheat was investigated with seeds infested by races of this bacterium. The factors studied were length of the period during which the seeds were soaked in bacterial suspension, hulling and wounding of the seeds, and the temperatures during seed infestation, germination, and growth; the localization and penetration of the bacteria into the developing plumule were also observed. Hulled barley proved far more susceptible to invasion than the nonhulled. The temperature during seed infestation of nonhulled barley failed to influence seed germination or seedling disease. The temperature during seed germination and seedling development, however, influenced emergence and seedling infection when seeds were infested with race 1 of the pathogen. Infection of barley, bromegrass, and wheat seedlings was facilitated by rupturing the testa covering the embryo prior to seed infestation. Diseased seedlings were obtained from infested hulled barley and bromegrass seeds that had been planted in the soil. A few diseased seedlings also developed from nonwounded infested wheat seeds. The bacteria were found to penetrate through wounds in the pericarp covering the embryo; infection of the plumule occurred through wounds or stomata on the coleoptile. The bacteria spread rapidly through these tissues and into the enclosed foliage leaves. Since the first foliage leaf is adjacent to the coleoptile, it became infected before emerging from the coleoptile. The infected leaf, by elongation, carried the bacteria into the aerial parts of the seedling.

Blight of oats caused by an *Helminthosporium* differing from the one producing leaf spot, H. R. ROSEN and H. W. LARSH. (Univ. Ark. et al.). (*Amer. Jour. Bot.*, 33 (1946), No. 3, p. 223).—An abstract.

Reactions of oat varieties and selections to four races of loose smut, E. D. HANSING, E. G. HEYNE, and T. R. STANTON. (Kans. Expt. Sta. and U. S. D. A.). (*Phytopathology*, 36 (1946), No. 6, pp. 433-445, illus. 1).—The four physiologic races of loose smut reported upon were collected in Kansas; two of them (A and D) were distinct from those reported by others. Race A is characterized by susceptibility of the Fulghum and Monarch varieties and resistance of Canadian; race D, by susceptibility of Richland and Victoria and resistance of Fulghum. Of the commercial varieties, Kanota and Fulghum were susceptible to race A, Richland and Columbia to B, and Richland, Columbia, and Otoo to C. Richland, Boone, Cedar, Tama, Fultex, Vicland, Florilee, and Traveler were susceptible to race D; Columbia and Forvie were intermediate; Ventura and Osage were susceptible in the greenhouse but intermediate to moderately resistant in the field; and Benton, Clinton, Fulton, Mission, and Goldwin had some resistance to this new race. Black Mesdag, Large Hull-less, Red Rustproof, Navarro, Markton, Bruncker, Bond, New Nortex, Neosho, Bonda, Mindo, and several promising hybrid selections were highly resistant to all four races: Neosho appears promising as a parent for oats crosses, being highly resistant to smut, resistant to the common races of crown and stem rusts, and having desirable agronomic characters. Neosho was distributed in Kansas in 1945.

Flag smut of wheat in Mexico, N. E. BORLAUG, J. G. HARRAR, and E. C. STAKMAN (*Phytopathology*, 36 (1946), No. 6, p. 479).—*Urocystis tritici* was first observed in Mexico on April 27, 1945, in an area of about 10 sq. miles near Zitacuaro. The fungus was apparently introduced on wheat from Australia originally intended for milling. Since most of the wheats grown in Mexico are susceptible, eradication, local quarantine, and seed treatment were instituted as protective measures.

Étude biologique de *Puccinia graminis* Persoon (rouille noire des graminées), L. GUYOT (*Compt. Rend. Acad. Sci. [Paris]*, 222 (1946), No. 10, pp. 566-568).—The results of a study of the physiological races of the wheat stem rust fungus *P. graminis tritici* in continental France are presented, along with a survey of the hosts—wild and cultivated—in that country, and a classification of the varieties of wheat in relation to their susceptibility to infection.

Why does grain spoil in storage? M. MILNER (*Minn. Farm and Home Sci. [Minnesota Sta.]*, 3 (1946), No. 3, pp. 1, 13-14, illus. 1).—On the basis of a 30-yr. investigation of grain spoilage and heating in storage by this station, the author briefly summarizes the causes with special reference to molds and moisture content and the essentials of good storage conditions.

Resistance of beans to halo-blight and anthracnose and the occurrence of bean-mosaic and bean-weevil, W. D. REID (*New Zeal. Jour. Sci. and Technol.*, 27 (1945), No. 4, Sect. A, pp. 331-335, illus. 1).—During the 1943-44 and 1944-45 seasons in New Zealand 72 varieties embracing 137 lines of dwarf and runner beans were tested for resistance to halo blight; attack by bean mosaic and bean weevil was also recorded. No one variety proved immune to halo blight and anthracnose, though all white-seeded and runner varieties were highly resistant to both; with few exceptions, varieties also exhibited an equivalent susceptibility to the two diseases. While the foliage and pod susceptibilities of a variety were usually of the same order, this was not true in all cases. Only 8 lines were infected with mosaic, and of these 6 were from recently imported seed; some lines showing the virus infection in previous years were now free from it. Records of field infestation with bean weevil suggested that varieties are widely different in susceptibility; the white-seeded and runner varieties had little or no infestation.

Spermogonia versus pycnidia in *Mycosphaerella brassicicola*, W. C. SNYDER. (Univ. Calif.). (*Phytopathology*, 36 (1946), No. 6, pp. 481-484, illus. 1).—Though a pycnidial stage of *M. brassicicola* has been described, only randomized ring spot lesions have been noted on infected leaves in the field; this suggests that all inoculum is wind-borne rather than partly water-borne. Inoculations of detached leaves were successful only with ascospores, never with ooze from the so-called pycnidia, nor was it possible to start cultures or obtain germination of the spores composing the ooze. Because of failure of the "pynospores" to germinate, grow, or produce infection on cabbage under conditions favorable to ascospore growth and infection, as well as because of their characteristic small size and appearance, it is concluded that they are spermatia rather than pycnospores, and that the structures in which they are borne are spermogonia. In single-ascospore cultures both spermogonia and perithecia were obtained, showing the fungus to be homothallic.

Preliminary note on the use of ammonium molybdate to control whiptail in cauliflower and broccoli crops, K. J. MITCHELL (*New Zeal. Jour. Sci. and Technol.*, 27 (1945), No. 4, Sect. A, pp. 287-293, illus. 2).—The majority of cauliflower and broccoli crops grown in the North Island (New Zealand) Services Vegetable Production projects contained a proportion of the plants showing very distorted growth and giving very poor yields; this malformation has been termed "whiptail." Insofar as known, the trouble had not previously been reported by commercial growers and their crops appeared to be normally free from it. Experimental study indicated that it can be controlled by dressings of 20 lb. or less per acre of $(\text{NH}_4)_2\text{MoO}_4$. A heavy application (1 ton per acre) of blood-and-bone fertilizer gave a 60 percent re-

duction in the number of affected plants. An application of 4 tons of CaCO_3 per acre immediately before setting out of cauliflower in one test gave no apparent control, but where in addition 3 cwt. of KCl per acre were used there was considerable—though not significant—reduction in the number of plants affected.

Parasitism of *Striga* sp. on *Dolichos lablab* Linn., F. W. ANDREWS (*Nature* [London], 157 (1946), No. 3990, p. 515).—A preliminary note on the parasitism of *Striga* on the roots of *D. lablab*.

The effect of depth of planting on the emergence and survival of blue lupine, P. DECKER. (Fla. Expt. Sta.). (*Phytopathology*, 36 (1946), No. 6, pp. 479-480, illus. 1).—The loss of seedling plants from *Rhizoctonia* spp. is said to be serious in the growing of blue lupine as a winter cover crop in Florida. Greenhouse plantings resulted in 94.1 percent emergence after 5 days for seeds sown 1 in. deep as compared with 54.7 percent after 10 days for seeds sown 2 in. deep; 3 weeks after sowing, 70.7 percent of the plants were growing for the first group, as compared with only 6.5 percent still alive for the latter.

Why less disease in Irish potatoes in 1945? Eastern North Carolina lost heavily in '43 and '44 but had very little disease loss in 1945, J. H. JENSEN (*Res. and Farming* [North Carolina Sta.], 4 (1946), Prog. Rpt. 2, p. 11, illus. 1).—The much warmer March–April in 1945 than in 1943–44 favored seed piece sprouting and establishment of healthy vigorous stands, and the death of young plants from root and stem rots—favored by cold soils—was small. In May–June of 1945 the weather was much cooler than in 1943–44; this held in check the two most serious diseases of the State—southern bacterial wilt and southern root rot.

A type of internal necrosis of the potato tuber caused by psyllids, W. C. SNYDER, H. EARL THOMAS, and S. J. FAIRCHILD. (Univ. Calif. et al.). (*Phytopathology*, 36 (1946), No. 6, pp. 480-481, illus. 1).—White Rose potato tubers artificially infested with large numbers of psyllids [*Paratrioza cockerelli*] exhibited—after 6 months' storage—an internal discoloration consisting of discontinuous dark flecks distributed almost throughout the tuber. Before becoming completely necrotic these flecks were observed microscopically to contain dark smooth spherical bodies of variable size in some cells within the fleck. It is concluded that under certain conditions a type of internal necrosis may occur as a tuber symptom of psyllid yellows.

Host parasite relations in pink rot of potato, N. H. WHITE (*Jour. Austral. Inst. Agr. Sci.*, 11 (1945), No. 4, pp. 195-197).—In this study, three distinct zones were recognized in potato tubers partly invaded by *Phytophthora erythroseptica*, viz, a zone of living uninvaded tissue, one of invaded but living tissue in which the fungus behaves as a true parasite, and a zone of invaded but dead tissue giving a characteristic pink coloration when exposed to O_2 , and in which the fungus lives as a saprophyte. Color changes in the dead zone are due to the tyrosinase reaction which is a post-mortem oxidase reaction resulting from the mixture of cell metabolites in the presence of O_2 . When *P. erythroseptica* invades the tuber tissue the presence of the intercellular mycelium increases the permeability of the host cells and causes a degradation of the phosphorylated compounds leading to decompensated respiration and finally the death of invaded tissues. The mechanism by which the fungus alters the permeability of the cells remains, however, unknown.

Some laboratory and field data on ring-rot of potatoes in California, P. A. ARK. (Univ. Calif.). (*Amer. Potato Jour.*, 23 (1946), No. 4, pp 170-181).—The ooze test—observation of the masses of bacteria coming out of

the diseased tissue in water mounts under the low power microscope—was successfully used in California for diagnosing ring spot of potato; it is considered a presumptive test. Incubation of seed pieces harboring the pathogen in a suitable substratum—such as peat moss or soil at 28°C.—revealed the disease in 3 weeks; this may prove helpful in ridding foundation stock of ring rot. Proper disinfection of contaminated tools is to a high degree impeded by the slime present in infected tubers. Under California conditions, bacterial soft rot is often secondary to ring rot, and probably black-leg may also be secondary to it.

Seed and soil treatment for the control of potato scab, L. A. SCHAAL (U. S. D. A.) (*Amer. Potato Jour.*, 23 (1946), No. 4, pp. 163-170).—Treatment of seed and soil with certain chemicals proved of no value in controlling scab infection in irrigated sandy soils of northern Colorado; these soils had produced several crops of heavily scabbed tubers previous to the tests. Treatment of such soils with HgCl_2 , $\text{Al}_2(\text{SO}_4)_3$, KI, S, yellow oxide of mercury, or sulfamic acid failed to reduce scab infection, but treatment of infected seed tubers with HgCl_2 reduced the number of infected tubers over the infected nontreated seed. When S was added with manure to the scabby soil 3 weeks before planting and again to the opened furrow at planting time, scab infection for the current and two following seasons was not reduced. None of the seed or soil treatments appeared of value for control of scab in the alkaline soils of northern Colorado; even treated clean seed produced scabby tubers in the scab-infested soil.

Ecology of the eelworm cyst, C. ELLENBY (*Nature [London]*, 157 (1946), No. 3988, pp. 451-452, illus. 1).—When cysts of the potato root nematode *Heterodera rostochiensis* are stimulated with potato root excretion, larvae begin to emerge after a delay of some days, the number emerging per day increases steadily, reaches a maximum, and then declines even though the cysts are freshly stimulated; finally no more larvae emerge, although the cysts still contain large numbers of eggs, and larvae will again emerge when the cysts are again stimulated after an interval of time. This stopping and later resumption of emergence is experimentally shown to be caused by factors operating within the cyst as a unit, and the cessation is believed to be due to an inhibitor. Clearly the eggs constitute an ecological community, and the behavior of individuals in it affects the behavior of the others. The possible influences of alterations in pH or of enzymes within the cysts are discussed on the bases of experimental results here briefly summarized.

Sugar-beet mosaic in New Zealand, R. E. F. MATTHEWS (*New Zeal. Jour. Sci. and Technol.*, 27 (1945), No. 4, Sect. A, pp. 294-302, illus. 7).—The author reports a mosaic disease occurring spontaneously on sugar beets. It is characterized by a mosaic mottling of the leaves; a study of the symptoms, methods of transmission, host range, and physical properties of the virus indicates it to be caused by the sugar beet mosaic virus (β virus 2 of K. M. Smith). Its incidence is summarized, and methods of spread and overwintering are discussed.

Verlag van het serologische onderzoek betreffende de vergelingsziekte der suikerbieten 1942-1943 [Contribution to the serological investigation of the yellows disease of sugar beets, 1942-43], H. L. BOOIJ, M. P. DE BRUYN OUBOTER, M. C. CREMER, and E. VAN SLOGTEREN ([*Netherlands*] *Lab. Bioembollen Onderzoek, Lisse*, No. 73 (1944), pp. 28+, illus. 7).

The present sugarcane disease situation in Louisiana, E. V. ABBOTT. (U. S. D. A.) (*Sugar Bul.*, 24 (1946), No. 17, pp. 129-130, illus. 1).—Curves showing the percentage of Louisiana sugarcane acreage in disease-resistant

varieties during 1928-45 render apparent the marked progress since 1930 in developing varieties with greater resistance to mosaic, root rot, and stubble deterioration. The detailed results are discussed briefly.

Response of sugarcane to the hot-water treatment, P. H. DUNKELMAN, W. J. LUKE, R. T. GIBBENS, and C. W. EDGERTON (*Louisiana Sta. Bul. 401 (1946), pp. 37*).—In tests over a 5-yr. period to determine the effectiveness of hot-water treatment, seed cane was submerged in hot water at 52°C. for 20 min. before planting. Replicated plots were set with treated and untreated seed cane on nine plantations, and plantings were made in August, September, October, and November. The chlorotic streak virus in the stalks was completely destroyed or inactivated by this treatment, which also stimulated growth of the buds and young shoots and resulted in better stands than with the untreated seed cane. No significant differences in the sucrose content of the cane were observed in plots planted with treated vs. untreated seed cane. In the August plantings, differences in yields between the two groups were small. In the September, October, and November plantings, however, material increases in yield were obtained with several varieties in the plots planted with treated seed cane. With such varieties as C. P. 29/320 and C. P. 28/19, these increases were 2.5 to 4.5 tons per acre of plant cane; smaller but significant increases were also obtained with the stubble crops. Even though a few varieties failed to show significant increases in yield, it would appear that with most varieties the profits to the planter would be increased by treating the seed cane.

Occurrence of curly-top virus in meristematic tissue, C. F. LACKEY. (U. S. D. A.) (*Phytopathology, 36 (1946), No. 6, pp. 462-468, illus. 2*).—This virus had previously been found to multiply and be translocated only in the host phloem; in parenchyma tissues it occurs in relatively low concentrations or not at all. The author here reports multiplication of the virus in meristematic tissue. Methods were designed to cut 0.4- to 0.5-mm. sections of beet and bean root tips below the protophloem sieve tubes. When these sections in a 5 percent sucrose solution were fed to nonviruliferous leafhoppers via a specially designed feeding cage, positive results were obtained in all of 22 tests. Direct feeding of leafhoppers on single living root tips in which only a 0.5-mm. length was exposed resulted in infection in 3 of the 7 tests made. When sections of bean root tips were similarly used, infection was obtained in all of 15 tests. When the bark was peeled off from Turkish tobacco and *Nicotiana glutinosa*—thus removing the external phloem and leaving a thin layer of cambium tissue—and scrapings of cambium from short sections of the stems were fed to leafhoppers, high percentages of infection were obtained from young severely diseased tobacco plants and less infection as the plants became older and started to recover. The author discusses the occurrence of these high concentrations of virus in meristematic tissues in the absence of apparent injury.

Plant nutrition in relation to disease development.—III, Fusarium wilt of tomato, J. C. WALKER and R. E. FOSTER. (Univ. Wis.). (*Amer. Jour. Bot., 33 (1946), No. 4, pp. 259-264, illus. 3*).—This part of the investigation (E. S. R., 94, p. 347) considers the relation of nutrition to fusarium wilt development in infected young tomato plants grown in sand in the greenhouse and supplied with solutions containing varying concentrations of all elements used. Within the experimental limits, disease development in susceptible or intermediate resistant hosts grown at optimum temperature for wilt decreased with increases in nutrient concentration regardless of the degree of virulence of the pathogen or the age of the plants. With use of graded

concentrations based on the Hoagland-Snyder series (E. S. R., 72, p. 625), increased nutrient concentration up to the 2H level occasioned an increased diffusion pressure deficit in cells of uninoculated plants. Growth of either the host or the pathogen alone was low in the 0.1H solution, reached a maximum in the IH nutrient, and decreased with further increase in total salt concentration. Unbalanced nutrition caused an alteration in susceptibility to wilt which was not correlated with total plant growth. Studies of the effect of nutrient balance on disease development revealed that infected plants receiving a low concentration of K or a high concentration of N exhibit an increasing wilt development. Solutions low in N or high in K induced a decrease in disease severity.

Interpretation of resistance to fusarium wilt in tomato, W. C. SNYDER, K. F. BAKER, and H. N. HANSEN. (Univ. Calif.). (*Science*, 103 (1946), No. 2685, pp. 707-708).—The experimental results reported appear to justify the conclusions that resistance is not localized in the root system, the substance responsible for it is not present in inhibitory amounts in the xylem stream, resistance originates in the living tissues of the plant and the material causing it does not migrate or diffuse into the xylem vessels, and field resistance to infection functions in living cells of the roots through which the fungus (*Fusarium oxysporum* f. *lycopersici*, a soil organism) must pass to become a vascular pathogen. The Bonny Best and Pan America tomato varieties were used in the study. Resistance in the latter is apparently a direct function of the cellular protoplasm of the plant similar to that of cabbage; it appears to be present but not localized in the root system and does not operate in the xylem.

Identity and known distribution of *Elsinoë piri* in Washington and Oregon, A. E. JENKINS, M. J. FORSELL, and L. W. BOYLE. (U. S. D. A.). (*Phytopathology*, 36 (1946), No. 6, pp. 458-461, illus. 2).—The recent finding of *E. piri* on apple and pear in western Washington and Oregon is of special moment in view of the economic importance of the susceptible fruit crop in the United States. West of the Cascade Range—as shown in a map—the disease was found in a special survey as follows: On apple in 7 counties of Washington and in 10 of Oregon, on pear in 3 counties of Washington and 1 of Oregon, and on quince in 1 county of Washington. Only the conidial (*Sphaceloma*) stage was observed. Typical spotting on leaves and fruit is illustrated.

Boron deficiency in apples—observations at New England Experiment Farm, J. A. HOLBECH (*Agr. Gaz. N. S. Wales*, 57 (1946), Nos. 1, pp. 17-21, illus. 5; 2, pp. 75-80, illus. 3; 3, pp. 132-136, illus. 3; 4, pp. 184-188, illus. 2).—In 1937—as a result of extensive investigations by the Department of Agriculture, New South Wales—certain recommendations were made concerning the use of borax for the control of internal cork. Further needed studies were continued at the New England Experiment Farm; the results of these later observations are here considered, including the growth and fruit symptoms and the classification of the latter into superficial cork, cork, internal cork, and corky core. Data on varietal susceptibilities are also presented. Trials of borax added to the soil indicated 1 lb. per tree to be effective and the results probably to last for 5 yr.; the most suitable time of application for this area was during June-August. A distinct advantage from hoeing the borax into the soil immediately after application was shown in the reduction in percentage of corky fruit. The findings indicated that where fruits were suffering from B deficiency, their keeping quality was greatly improved by the treatment, and the condition and life of the fruits in cold storage were not adversely affected except when excessive amounts of B were applied to the

trees. Finally, the author considers the damage due to use of excessive amounts of B, the "measles" condition of the Delicious variety, and detailed recommendations for borax treatment.

Injury to apricot leaves from fluorine deposit. E. R. DE ONG (*Phytopathology*, 36 (1946), No. 6, pp. 469-471, *illus.* 1).—Fluorine deposited on apricot trees from an aluminum reduction plant resulted in a characteristic type of foliage injury. The growing tips appeared unaffected, but wilting developed on the edges of the leaf when 2 to 3 weeks old and became progressively more pronounced for about 10 days, when the tissue was brown and dead. The central part of the leaf usually remained unaffected; the dead margins weathered away, often leaving the central uninjured part of the leaf still intact. There was much gumming of the young twigs, and gum pockets developed on the trunks of some of the 5-year-old trees. Defoliated areas 5 to 16 in. long were observed on the older twigs. The degree of injury varied with type of soil, and the effects were intensified by lack of rain. Injury was most pronounced within 2 miles of the reduction plant and to a decreasing degree up to 8 miles to the windward side. After closing of the plant, new growth became normal within 3 weeks. The fluorine content ranged from 247 to 403 p. p. m.

Some aspects of the aerial dissemination of spores, with special reference to conidia of *Sclerotinia laxa*, E. E. WILSON and G. A. BAKER. (Calif. Expt. Sta.). (*Jour. Agr. Res.* [U. S.], 72 (1946), No. 9, pp. 301-327, *illus.* 5).—Conidia of *S. laxa*—cause of a blossom blight of stone fruits—are produced in large numbers during late winter on blossoms and twigs affected the previous spring. These are detached by low-velocity winds and, judging from their rate of fall in still air, are readily transported by air currents. Spread through apricot orchards via airborne conidia northward from well-defined sources of spores has been observed. For three disease gradients studied in 1939 the mean levels of blossom infection in trees 22, 44, 66, and 88 ft. from the nearest source trees were 39, 21, 12, and 6.5 percent, respectively, of the level in source trees; for four gradients studied in 1940 the corresponding values were 55.5, 40, 28, and 23. The mathematical treatment of these data minimized or eliminated the effects of such factors as the number of spores produced and liberated at the source, the length of the dissemination periods, and variations in the environmental conditions that initiate infection. For this reason, an explanation of the difference between the 1939 and 1940 gradients was sought elsewhere. In 1939 and again in 1940 there was only one period at the susceptible blossoming when the direction of the wind favored spore dissemination northward. During the 1940 period mean wind velocities were 1.88 times higher than during the 1939 period. The amount of blossom infection was assumed to be proportional to the number of spores reaching the blossoms, and the ultimate characteristics of the gradients were judged to be expressions of variations in the aerial density of spores during the effective dissemination periods. Factors capable of disturbing the relations between disease incidence and aerial density of spores are discussed.

Variations in aerial density of spores with increase in the distance from their source were studied by releasing *Lycopodium* spores and catching them on grass slides placed 5, 10, and 15 ft. downwind from the point of release; the density varied approximately in inverse proportion to the square of the distance from the source. According to other tests the over-all distribution of these spores along the vertical and horizontal axes of intercepting planes followed roughly that of normal probability. The standard deviations of the

distributions were therefore employed to express the degree of dispersion at various distances from the source; these values increased approximately in proportion to distance from source. At equivalent distances, however, the standard deviation for horizontal distributions (σ_h) were consistently greater than those for vertical distributions (σ_v). When spores were released 7.5 ft. from the ground, the mean σ_h/σ_v ratio proved to be 1.55, a value very close to the 1.59 obtained by others in measuring the amplitude of the horizontal and vertical components of air turbulence. Studies of the dispersion of small puffs of ammonium chloride "smoke" gave similar results. The effect of leafless trees on the vertical dispersion of spores was also studied. The rate at which aerial density of spores decreased with increases in distance from the source was apparently not affected by variations in wind velocity between 2 and 16 miles per hour. For winds below about 5 miles per hour, however, dispersion at a given distance from the source was often greater than that for medium and high velocity. Between medium and high velocities, on the other hand, dispersion varied little within the 5 to 15 ft. studied. Since frictional turbulence increases with wind velocity, aerial dispersion of spores should likewise increase, other things being equal. The degree of dispersion at a given distance from the source, however, is determined by the rate the spores are dispersed in relation to the rate they are carried downwind. On the whole, the experimental results indicate that dispersion increased at about the same rate as wind velocity except below about 5 miles per hour; further study of this point is deemed desirable.

To compare the results from observations on disease spread with those from the experiments, the latter were generalized in terms of dissemination (1) from a three-dimensional block source instead of from a "point" source, (2) through orchard trees instead of over open ground, and (3) for distances up to 100 ft. instead of 15 ft. Certain gaps were bridged by assumptions, which, if rendered untenable by further studies, can be modified. Though the results of this treatment must remain provisional, the observed spread of the disease through the apricot orchards is described to a good first approximation by an equation of the form $y = A/X^p$, where y is the ratio of the percentage of blossom infection in a vertical slice of susceptible tissue (blossom) at a horizontal distance from the source block to the percentage of blossom infection in the source trees, A and p are constants depending on wind velocity and perhaps to a lesser extent on other quantities, and x is the horizontal distance from the center of the nearest source trees. There are 20 references.

Eradicating stunt diseased bushes, C. A. DOEHLERT. (N. J. Expt. Stas.). (*Cranberries*, 10 (1946), No. 12, pp. 24-25).—Preliminary tests of a spray of Ammate, Prestol, and nicotine sulfate appeared to meet the requirements of (1) killing by a contact spray all the insects on the blueberry plant to prevent further transmission, (2) killing the foliage quickly to prevent further feeding, and (3) killing the tops and roots to render unnecessary further observations on the plant. Spraying with 2,4-D failed to destroy the foliage.

Search for an insect carrier, W. W. TOMLINSON, JR. (N. J. Expt. Stas.). (*Cranberries*, 10 (1946), No. 12, p. 11).—Preliminary to tests for suspected vectors of the virus blueberry stunt disease, the author reports trying out about 2 doz. leafhoppers swept from blueberry bushes throughout the summer on an exclusive blueberry plant diet, those surviving for 2 weeks being deemed active blueberry feeders and therefore possible vectors. Several other insects were similarly tested.

A note on banana leaf speckle in Jamaica and some associated fungi, E. B. MARTYN (*Imp. Mycol. Inst., Mycol. Papers No. 13 (1945), pp. 5+*, *illus. 3*).—The author found that in Surinam the most conspicuous form of "speckling" was due to *Chloridium musae*. Another fungus, weakly parasitic on the leaf, is here described as *Cladosporium musae* n. sp. A third fungus constantly found growing epiphytically on the under surface of the leaves and especially near the margins is here described as *Zygophiala jamaicensis* n. gen. and sp. Besides the last, the related fungus *Zygosporium oscheoides* has also been encountered on leaves from one or two localities.

The unknown disease of the coconut palm in Jamaica, R. LEACH (*Trop. Agr. [Trinidad], 23 (1946), No. 3, pp. 50-60, illus. 8*).—In the past a serious disease of coconut palms in Jamaica had been considered the same as bronze leaf wilt in Trinidad; it is believed from the findings of this study that the two are distinct. Until the cause of the Jamaica disease is determined the author is referring to it as the "unknown disease" of coconuts. The symptoms are described in some detail and compared with those of the bronze disease. The growth of the leaves, nuts, and spathes of healthy and diseased palms was recorded throughout the year. The disease has affected palms far more in the wet than in the dry season, the trees apparently being more susceptible when growth is stimulated. Possible causes are referred to briefly. The author believes that it may be associated with a facultative root parasite but that soil conditions are the main controlling factor inasmuch as they affect the nutritive status of the trees. It is suggested that investigations should be confined largely to studying the etiology of the disease on very young seedlings which are known to succumb on certain soils; such plants are much more easily handled than the larger trees.

Seasonal changes in biological equilibria involving two chondriosomal systems in variegated Hosta, M. W. WOODS and H. G. DU BUY. (*Univ. Md. et al.*). (*Phytopathology, 36 (1946), No. 6, pp. 472-478, illus. 4*).—White variegated areas of the plantain lily were found due to colorless plastids which, under certain conditions, multiplied at rates differing from the normal plastids in cells containing both types (heterochondric cells). In leaves formed during spring or fall the variegation-inducing plastids apparently suppressed the multiplication of normal plastids in heterochondric cells, the leaves becoming strongly variegated; the reverse was true during summer, when "masking" of symptoms occurred in successively formed leaves. The vascular tissues of the leaf exerted an influence on adjacent mesophyll of such a nature that multiplication of normal plastids frequently seemed to occur at the expense of the variegation-inducing plastids in heterochondric cells, regardless of season. The bearing of these results on cancer and virus problems is discussed.

Further field observations on fused needle disease of pines, W. NEILSON-JONES (*Empire Forestry Jour. [London], 24 (1945), No. 2, pp. 235-239, illus. 1*).—Continued observations (E. S. R., 88, p. 496; 92, p. 182) of field experiments at Wareham Forest (England) over a 9-yr. period indicated that application of compost in the presence of adequate phosphate at sowing time almost entirely prevented the development of the fused-needle disease in *Pinus contorta*. Similar applications to a 9-year-old stand already exhibiting 60 percent of affected trees reduced the incidence 50 percent during the course of 5 yr. Basic slag alone led to definite amelioration, but its effect was apparently not lasting.

Interim report on trials of copper naphthenates and mercuric naphthenates as wood preservatives, A. G. V. BERRY (*Empire Forestry Jour. [Lon-*

don], 24 (1945); No. 2, pp. 233-235).—The authors report very promising results with wood specimens treated with these metallo-organic salts dissolved in gas oil and applied as solutions to specimens of wood by the open tank process and exposed under rigorously destructive tropical conditions for almost 6 yr. Besides the tests with the metallic naphthenates, 10 pieces of white pine were impregnated with gas oil only, this being identical with that used as a solvent for the naphthenates; results here were so good as to confuse the tests with the gas oil-dissolved naphthenates, and further trials are being made.

ECONOMIC ZOOLOGY—ENTOMOLOGY

Experimental analysis of methods for measuring small mammal populations, L. F. STICKEL (*Jour. Wildlife Mangt.*, 10 (1946), No. 2, pp. 150-159, illus. 3).—The number of *Peromyscus leucopus* caught by snap traps in the central acre of a 17-acre study area represented the population of this central unit plus surrounding acres. By currently accepted methods of interpreting snap-trap data, the population per acre would be considered as 23 adults, but these data indicate that the true population was between 6 and 7 adults per acre. Modern methods of live-trapping are shown to be valid for population studies; two methods are presented for the conversion of such data into per acre figures. Errors involved in the current use of snap-trap data are discussed, and snap-trap methods are shown to be invalid for determining actual population numbers. It should, however, be practical to use a snap-trap quadrant technic for obtaining a relative measure or index figure for small mammal populations. There are 20 references.

Soil-fertility standards for game food plants, S. A. WILDE. (Wis. Expt. Sta. et al.). (*Jour. Wildlife Mangt.*, 10 (1946), No. 2, pp. 77-81).—Surveys of forest soils and vegetation in Wisconsin have indicated that many important fruit-bearing trees and shrubs have a greatly restricted quantitative distribution; by reason of their contents in vitamins and other functional substances they may be essential in wildlife welfare. A detailed study was started in 1944 of the soil requirements of a few species for use in future artificial propagation. The present paper attempts to express some environal conditions in terms of concrete data on species for artificial propagation and their soil fertility requirements in nurseries and in the field. As to the silvicultural aspects of planting for game, one way to avoid certain European experiences would be to build the forest with all its natural associates from the plant and animal kingdoms and not merely as a barren framework of lumber. The introduction of some secondary trees and shrubs might have a greater indirect silvicultural influence than a direct bearing on game management.

The effect of mating time upon reproduction in foxes, C. K. GUNN (*Empire Jour. Expt. Agr.*, 13 (1945), No. 52, pp. 193-198, illus. 3).—Data from the same group of 274 vixens—analyzed by two methods—indicated that mating in the early period of estrum gives a higher production rate (i. e., average litter size of all mated vixens) than when mated late in estrum. No significant difference in average litter size was found between early- and late-mated groups of vixens later proving gravid. Statistical analyses gave no significant difference between the average litter size of 132 vixens mated during their first day of estrum and 80 mated on the second day. Similarly—using the vaginal smear test—no real difference was found between the average litter size of the early group of 43 vixens mated during proestrus and 73

mated during the early cornified-cell stage. A significant increase in the number of nonpregnancies after mating occurred in third- and fourth-day matings compared with matings on the first and second days of estrum. The findings—analyzed on a basis of the vaginal smear test—confirmed these results. The estrus period in foxes was found by both test methods to vary in duration from 1 to 4 days, with exceptional cases extending to 5 or 6 days.

A comparison of carotene and vitamin A utilization by the fox, C. F. BASSETT, L. E. HARRIS, and C. F. WILKE. (Cornell Univ. et al.). (*Cornell Vet.*, 36 (1946), No. 1, pp. 16-24, illus. 1).—Thirty-four fox pups and their dams were put on a 14-day vitamin A-deficient diet beginning when the pups were 21 days old. When 35 days old the pups were allotted at random to 6 experimental groups in each of 2 series. All received the same vitamin A-low basal diet throughout the experiment and, in addition, those in series 1 received supplemental amounts of vitamin A and those in 2 received carotene fed at levels of 0, 15, 25, 50, 200, and 600 International Units per kilogram of body weight per day. The pups were weaned when 49 days old. Blood samples were taken by cardiac puncture at about the middle and end of the experiment to determine the vitamin A content of the blood, and all test animals were killed at pelting time and the liver was removed, ground, and analyzed for vitamin A. The findings indicated that the fox can utilize carotene as a source of vitamin A, but less efficiently than the vitamin per se. Until further data are available it is thus recommended that growing foxes be fed 100 to 600 I. U. (360 μ g.) of carotene per kilogram by body weight per day; it is believed probable that a smaller amount of carotene and possibly of vitamin A also can be fed when more data are available.

Bone growth as an age criterion in the cottontail rabbit, H. P. THOMSEN and O. A. MORTENSEN. (Univ. Wis.). (*Jour. Wildlife Mangt.*, 10 (1946), No. 2, pp. 171-174, illus. 1).—This preliminary report indicated that young-of-the-year can be differentiated from adult cottontails by X-raying the bones or by staining them to show the presence or absence of epiphyseal cartilage. This cartilage persists in the shoulder regions of some rabbits (presumably the latest-born) until January, and probably in the earliest-born through November—when most rabbits are taken by hunters. Further verification is needed of the safe terminal date for age classification by various bones.

Calculating poison bait mixtures, T. I. STORER. (Univ. Calif.). (*Jour. Wildlife Mangt.*, 10 (1946), No. 2, pp. 177-180, illus. 2).—Whenever a quantity of any bait is to be prepared, some calculations are necessary unless the amount is exactly that of an available formula. More elaborate calculations are needed if it is desired to change a formula or to compare two or more. Much time may be saved in these and similar problems by use of a nomogram with which—knowing the values of any two items—the third may be quickly calculated; the chart presented and discussed has been prepared to facilitate such calculations.

Evaluating rat baits by field acceptance trials on Guam, W. D. CRABB and L. O. EMIK (*Jour. Wildlife Mangt.*, 10 (1946), No. 2, pp. 162-171, illus. 4).—Various baits were evaluated against a standard bait of plain rolled oats, usually the criterion of significance of difference between mean acceptances; rolled oats was repeatedly demonstrated the cereal of choice. Three oily bases proved superior as adjuvants to the cereal in the following order: Ground fresh copra, copra oil, and peanut butter; the optimum ratio of copra to rolled oats lay at 1 : 4 to 1 : 6. Replications of trials gave important additional evidence: Significance of differences became more reliable as the degrees of freedom attributable to error increased; the validity of

using interaction as the error term in single trials was substantiated by analysis of replications.

Alaria taxideae n. sp., from the badger and other mustelids, G. SWANSON and A. B. ERICKSON. (Minn. Expt. Sta. et al.). (*Jour. Parasitol.*, 32 (1946), No. 1, pp. 17-19, illus. 7).—This new species of fluke from Minnesota is described from the adult stage.

New host records for the trombiculid mite *Acariscus masoni* Ewing, D. S. FARNER and E. A. SEAMAN (*Jour. Parasitol.*, 32 (1946), No. 1, p. 93).—A brief note.

Observations on the tropical rat mite *Liponyssus bacoti* as an ectoparasite of laboratory animals and suggestions for its control, T. A. OLSON and R. G. DAHMS (*Jour. Parasitol.*, 32 (1946), No. 1, pp. 56-60).—In April 1945, a heavy infestation of this mite occurred on hamsters, rats, and mice in a medical laboratory animal house in Texas; the hamsters were particularly susceptible, and several died. Rats, mice, and guinea pigs placed in infested cages after a dead hamster had been removed died in a short time, apparently as a result of exsanguination rather than disease or toxic effects. A trial application of DDT to small amounts of infested bedding (wood shavings) resulted in good control; general treatment of the animal house based on this information proved effective for at least 1.5 mo. and had no ill effect on rats or hamsters but was toxic to mice. During the first 24 hr., 30 percent of the ♀ mice in the breeding colony died. Although only two young mice had died by the third day, a large loss took place during the following 11 days; it is believed that this anomalous result should be ascribed largely to the early loss of ♀♀, many of which were nursing the young at the time of their death. Adult ♂ mice appeared more resistant, since all survived. Observations of living mites during the study showed that engorged ♀♀ laid two to eight eggs within a 34-hr. period; these sometimes hatched within 24 hr. or less, and the six-legged larvae—though receiving no blood meal—transformed into first-stage nymphs within 1 to 2 days.

New records of *Macracanthorhynchus hirudinaceus* in Sciuridae, R. RAUSCH. (Mich. State Col.). (*Jour. Parasitol.*, 32 (1946), No. 1, p. 94).—The fox squirrel and chipmunk are reported parasitized by *M. hirudinaceus*. That the fox squirrel seems a satisfactory host for this roundworm is considered important, since it could serve as a reservoir host for infection of pigs.

A redescription of *Physaloptera limbata* Leidy, 1856 (Nematoda: Physalopterinae), B. B. MORGAN. (Univ. Wis.). (*Jour. Parasitol.*, 32 (1946), No. 1, pp. 69-71, illus. 3).—This roundworm is redescribed from parasitized moles and shrews collected from several States (Wis., Mo., Ind., Ohio, Kans., Iowa, Md., Vt., N. H., and Ill.).

Significance of racial variation in birds to wildlife management, J. W. ALDRICH (*Jour. Wildlife Mangt.*, 10 (1946), No. 2, pp. 86-93).—A general discussion based on current knowledge (12 references) of bird species and races and on the significance of races to wildlife management—with examples.

General notes (*Auk*, 63 (1946), No. 2, pp. 245-246, 248-249, 260-261).—Of special interest to economic ornithology are Avian Leukosis and the Great Black-Backed Gull, by M. Hare; Death of a Trumpeter Swan From Multiple Parasitism, by I. M. Cowan; and Predation on Living Prey by the Black Vulture, by A. Sprunt, Jr.

Evidence of trans-Gulf migration, G. H. LOWERY, JR. (La. State Univ.). (*Auk*, 63 (1946), No. 2, pp. 175-211, illus. 1).—For many years ornithologists have been agreed that vast numbers and many kinds of land birds migrate

straight across the Gulf of Mexico each spring and fall. Recently the existence of this trans-Gulf fly way was denied on theoretical grounds; consequently, further direct field investigation became desirable. This paper is concerned chiefly with the preliminary results of such a study.

Scores of records of 62 species seen crossing the Gulf of Mexico during the migration period are now available. The intentional nature of these crossings is demonstrated by the fact that all except one of these birds were proceeding in the seasonal direction of migration. Trans-Gulf flights of tremendous magnitude are indicated by the exact parallel between the phenomena of migration over the Gulf coast regions and over the Gulf itself, by observations of low-flying migrants seen from land at the beginning or end of their trans-Gulf journey, and by the high flight densities over the coast of Yucatán in spring as revealed by telescopic studies. All evidence adduced by others to show that land birds migrate exclusively by coastal routes is believed compatible with the theory of trans-Gulf migration, properly understood. There are 36 references.

Summer birds of the Okoboji region, 1938-1942, R. L. KING (*Iowa Acad. Sci. Proc.*, 51 (1944), pp. 467-470).—A list of the birds observed in this Iowa area is presented.

A preliminary report on the food of ducks at Reelfoot Lake, Tennessee, R. J. SCHOFFMAN (*Jour. Tenn. Acad. Sci.*, 21 (1946), No. 1, pp. 10-13).

Further use of wood duck nesting boxes in Wheeler Wildlife Refuge, P. BRYAN (*Jour. Tenn. Acad. Sci.*, 21 (1946), No. 1, pp. 76-77).—Further notes on the utilization and permanence of the 98 nesting boxes reported upon previously (E. S. R., 93, p. 597).

Age and sex criteria and weights of Canada geese, W. H. ELDER. (Ill. Nat. Hist. Survey). (*Jour. Wildlife Mgmt.*, 10 (1946), No. 2, pp. 93-111, illus. 14).—Of 2,179 Canada geese weighed on an Illinois wintering ground, only 6 and these ♂♂—exceeded 10 lb. Among weights of 1,028 live geese handled in banding studies, juvenile ♀♀ averaged 6.5 lb., juvenile ♂♂ 7.5 lb., and adult ♂♂ 8.4 lb. There was a highly significant difference between weights of juveniles and adults of both sexes and between weights of ♂♂ and ♀♀ at any age. Comparison of November-December with January-March weights indicated a significant loss in weight at the close of the hunting season, when crops provided for geese on a refuge were completely exhausted, indicating that the carrying capacity had been exceeded and that the sporadic winter feeding was inadequate. This condition may affect the fecundity of adults and determine how soon a young goose starts to breed. The simplest and most reliable criterion for distinguishing first-year geese is said to be the notch in the tips of the tail feathers. The tail molt is continuous and centrifugal through the winter. Various other types of plumage variation were examined, but most of them were too infrequent or present in all age groups. Methods were devised for cloacal examination and instruments constructed to facilitate it and to measure bursal depth. The penis of the juvenile ♂ does not exceed 3×10 mm. in size and is said to be an absolutely reliable age criterion. In the ♀♀ the opening of the oviduct into the cloaca is not evident until sexual maturity; it was never found in second-year birds, but was open in some third-year birds in a captive flock. Measurements of the bursa of Fabricius indicated much variability in the rate of its resorption in Canada geese. Resorption was incomplete during the first and frequently the second year. Geese with no bursa were 3 yr. or more old; those with a bursa less than 15 mm. in depth were 2 to 3 yr. old; and those with a bursa more than 15

mm. deep may be in the first, second, or third (?) year of life. There are 56 references.

Bobwhite quail reproduction in southwestern Texas, V. W. LEHMANN. (Tex. A. and M. Col. et al.). (*Jour. Wildlife Mangt.*, 10 (1946), No. 2 pp. 111-123, illus. 4).—Studies of 194 bobwhite nests in a Texas refuge (1942-43) revealed that breeding extended from late March through September, pairing occurring principally among members of the same coveys and laying sometimes beginning before the covey bonds were broken. Breeding activity was staggered, and reneating was influenced importantly by rainfall. Mesquite semiprairie furnished the most popular breeding range, and bluestem, joint grass, and needlegrass were favorite nesting covers. Quail evidently preferred to nest in grass about 9 in. tall and containing considerable green material. Nest bowls averaged about 4 in. in diameter at the top and 2.5 in. in depth. The average size of the egg clutch decreased as the season advanced, in the spring of 1943 averaging 14.8 eggs but in late summer 10.5. Hatchability was high in spring, decreasing as the weather warmed. Predation by coyotes, skunks, snakes, and fire ants is discussed. Flexible range can accommodate more coveys in certain years than in others, but "good" years produce few new territories in static range. Fall and winter populations are therefore poor barometers of breeding success on static ranges unless the latter are decidedly underpopulated. Important factors regulating quail reproduction in this Texas area are rainfall and coyote predation. Quail are limited by overgrazing, however, on many ranches, and extensive coyote control on such areas would hardly be justified for quail increase.

Mobility of bobwhite quail in southwestern Texas, V. W. LEHMANN. (Tex. A. and M. Col. et al.). (*Jour. Wildlife Mangt.*, 10 (1946), No. 2, pp. 124-136, illus. 4).—The bobwhite population of a 960-acre Texas area was found to have moved about much more than indicated by published observations in other regions; some individuals and coveys were relatively sedentary, but the population as a whole underwent continuous movement. Individual birds in winter ranged over strips slightly more than one-fourth of a mile long, but the increase in width of range was small. Range expansion was sometimes gradual, but certain birds leap-frogged from one territory to another. Most quail, it appeared, are acquainted with territories about one-half mile long at 16 mo. of age. Many coveys disappeared from the study area in winter and others disintegrated. Movement during particular periods and fluctuations in densities appeared largely independent of habitat conditions. Ten winter ranges averaged about 643 by 178 yd. All covey ranges over-lapped; intraspecific intolerance to crowding appeared unimportant except in competition for choice resting or "headquarters" cover at midday. Covey ranges apparently did not shrink or expand as populations increased or decreased.

Winter food of bobwhite quail in Virginia, W. P. BALDWIN, JR., and C. O. HANDLEY. (Va. A. and M. Col. et al.). (*Jour. Wildlife Mangt.*, 10 (1946), No. 2, pp. 142-149, illus. 1).—Examination of the crops of 495 bobwhite quail collected throughout Virginia during November 15-January 31 revealed that the total food comprised 98 percent plant and 2 percent animal matter. Marked variations occurred in the volume consumed from month to month and section to section for certain species and groups of food items. The native legumes were most important, followed in order by common ragweed, cultivated legumes, cultivated grains, mast, miscellaneous seeds, fruits, animal matter, forage, and native grasses. Native and crop legumes together made over 40 percent of the total winter food. Over 25 percent of the diet was from cultivated crops of all kinds, and a large proportion resulted from agricultural

practices that encouraged the growth of ragweed and common lespedeza throughout the countryside.

Mechanical value of grit for bobwhite quail, R. B. NESTLER (*Jour. Wildlife Mangt.*, 10 (1946), No. 2, pp. 137-142, illus. 1).—This investigation of 1,372 pen-raised birds in a Maryland refuge revealed that grit as a grinding agent is unessential for their growth, welfare, or reproduction. Seeds such as wheat, millet, milo, soybean, field pea, and vetch were successfully macerated and digested without its aid. When very hard seeds are ingested in the wild, they themselves apparently serve as grinding agents.

The relation between number of ears opened and the amount of grain taken by redwings in cornfields, D. W. HAYNE. (Mich. Expt. Sta.). (*Jour. Agr. Res. [U. S.]*, 72 (1946), No. 8, pp. 289-295, illus. 1).—Damage to corn by flocks of the eastern redwing (*Agelaius phoeniceus phoeniceus*) is said to occur locally over a large part of the United States. The feeding by a single bird is small, but on each of a large number of ears; thus the total injury in any one field is the sum of a large number of small amounts of grain eaten during several weeks while the kernels are ripening. The relation between the proportion of ears opened in a field (x) by the birds and the proportion of grain removed (y) is, $y = -2.30b \log(1 - x)$, where b is the fraction of corn in an ear taken per bird, per visit. The field records given consist of 198 estimates of damage in fields during the 1941-42 seasons; these are classified into 63 groups fitted to the above curve, using logarithms and the method of least squares as ordinarily applied to fitting a straight line. The equation thus derived is, $y = -0.0062 - 0.2745 \log(1 - x)$. There is thus a definite relation between the proportion of ears opened and that of grain taken, though this relation is not linear. The larger the number of ears opened, the higher is the loss in grain.

Blood parasites of the magpie and English sparrow of eastern Washington, E. D. WAGNER (*Bird-Banding*, 17 (1946), No. 2, pp. 72-74).—Studies of 52 magpies and 25 English sparrows revealed *Haemoproteus picae*, *Leucocytozoon berestneffi*, *Trypanosoma avium*, and microfilaria in the magpies, but only microfilaria in the sparrows.

A combination photoelectric light meter and fish-detector, A. D. HASLER and L. V. WHITNEY. (Univ. Wis. et al.). (*Jour. Wildlife Mangt.*, 10 (1946), No. 2, pp. 175-177, illus. 2).—The ichthyometer described and illustrated is reported to have been used successfully to chart migration times of perch in Lake Mendota, Wis. Initial results indicated that the detector differentiates between small, medium, and large schools of perch, and therefore has a variety of applications such as observing activity and movements at night, at depths beyond the range of vision, in turbid waters, and in winter under the ice.

Lethal alkalinity for trout in waters of low salt content, G. J. EICHER, JR. (*Jour. Wildlife Mangt.*, 10 (1946), No. 2, pp. 82-85).—Alkalinity was found a highly lethal factor for trout in Arizona waters low in buffering agents; the symptoms induced are described. Alkaline conditions result from removal of CO_2 by aquatic vegetation through photosynthesis, resulting in the break-down of bicarbonates into carbonates. Increasing the turbidity lowers the pH by cutting off the light reaching the plants, with consequent lowering of the photosynthetic rate. Introducing fish into streams during periods of turbidity permits them to gain tolerance by the time the pH again rises. Trout were killed under certain conditions at pH 8.8, whereas under others they survived at pH 10.2. This situation may possibly be overcome by

changing the water conditions, by tempering the fish before planting, or by developing species or strains of fish tolerant to such high alkalinity.

Water temperature and spring fishing, Norris Reservoir, Tennessee, J. S. DENDY (*Jour. Tenn. Acad. Sci.*, 21 (1946), No. 1, pp. 89-93, illus. 2).—The best fishing in this reservoir is said to be in early spring and at that time the bass taken are of large average size. The knowledge that temperature greatly influences fish movement in early spring and that at this time the waters are much warmer upstream than in the lower reaches of the reservoir may be of considerable value to anglers. Angling for bass will be best in waters where the temperature is about 60° F. or above, and therefore will tend to be in shallow waters in quiet bays; it may be expected to be best on warm sunshiny days and in midafternoon. In early spring a cold spell may be expected to affect fishing adversely. It is suggested that a pocket thermometer may be of considerable help. If artificial lures are used in water with a temperature above 60°, the angler will have an acceptable explanation for taking few if any fish. Since weather, wave action, temperature of inflowing water, and other factors may all influence the fishing, early spring angling is highly unpredictable because the temperature of the water cannot be anticipated.

Depth distribution of fish in lower Wheeler Reservoir, Alabama, P. BRYAN and H. H. HOWELL (*Jour. Tenn. Acad. Sci.*, 21 (1946), No. 1, pp. 4-9).—"The netting study, though not intensive enough to provide conclusive evidence, suggests that game fish may not be abundant in lower Wheeler Reservoir; that the scarcity of game fish here, as compared to a storage reservoir (Norris), may not be due to the numbers of rough fish present; and that there is a tendency, still unexplained, for fish to avoid the bottom."

Further studies of depth distribution of fish, Norris Reservoir, Tennessee, J. S. DENDY (*Jour. Tenn. Acad. Sci.*, 21 (1946), No. 1, pp. 94-104, illus. 4).—Earlier findings (1943) have already been reported (E. S. R., 93, p. 598); information obtained the second year of the investigation and a comparison of distribution for the two years are here presented. Data from the 1944 netting studies agreed closely with those for 1943 as to the effects of depth, temperature, and bottom on fish distribution, though the water failed to warm quite as rapidly in the second year. As a whole, the 1944 fish population tended to be in slightly cooler and shallower water. In both seasons, fish were caught in water containing too little oxygen to support them over extended periods. In normal years a close enough correlation exists between temperature and fish distribution to permit prediction of summer distribution by making temperature determinations and by noting the distribution for comparable temperature conditions in 1943 and 1944. Since most of the sauger and walleye crop is currently unused, even with year-round fishing, the depth information may improve the harvesting of the crop and, what is equally important, may reduce the number of "un-successful" summer fishing trips.

Spring fishing on several TVA storage reservoirs, 1945, R. W. ESCHMEYER, D. E. MANGES, and O. F. HASLBAUER (*Jour. Tenn. Acad. Sci.*, 21 (1946), No. 1, pp. 78-88).—In 1945—the second season of year-round fishing on Norris Reservoir—a creel census and fisherman count were carried out during April-June; a census was also taken on three other TVA storage reservoirs. The total catch during the second year on Norris Reservoir undoubtedly exceeded that in 1944. A decided difference was noted in the composition of the catch. Crappie were far better represented in 1945; this is attributed partly to a trend toward increased numbers in the reservoir and partly to the very early

warming of the water. Though many bass were taken in March, the number per fishing trip during the census period was considerably below that taken during the same 3-mo. period in 1944. In early 1945—as in the spring of 1944—there was a heavy mortality of large bass, suggesting that the large catch in the spring of 1944 was not excessive and that it represented only a small portion of the adult bass population. For the same period creel census data indicated that even though Norris had yielded almost 275,000 lb. of fish in early 1944 while the other three reservoirs under study were closed to fishing, the average Norris catch was exceeded in 1945 by only one of the other three. Although several more years of census taking are necessary before the trend in fishing can be fully determined, there is as yet no reason to believe that year-round fishing results in an excessive catch.

Food of several species of fish, Norris Reservoir, Tennessee, J. S. DENDY (*Jour. Tenn. Acad. Sci.*, 21 (1946), No. 1, pp. 105-127, illus. 5).—This inquiry included examination of the stomach contents of largemouth bass, smallmouth bass, spotted bass, walleye, sauger, drum, black crappie, channel catfish, and shad; most of them were caught in gill nets during depth distribution studies, 1943-44. Feeding records from natural bodies of water are compared with those from "reservoir" situations. Crawfish, though an important food in natural waters, were virtually absent in Norris; aquatic insects were also scarce. Small shad were the most important food for game fish in this reservoir; black crappie ranked second, and bluegill, skipjack, and miscellaneous items were of less importance. The most important chain was plankton to shad to game fish; the food chain in Norris was short because of lack of aquatic vegetation and the associated biota along the margin of the reservoir. Seasonal differences in the utilization of shad, black crappie, and bluegill by largemouth bass, walleye, and sauger were found to be closely similar. Competition for food among adults of the different fish species is not believed serious because of ample supplies of food and differences in depth distribution. The young shad are available through a great range of depths. There are about 2.5 pages of references.

Utilization of the sauger crop in Norris Reservoir, Tennessee, R. W. ESCHMEYER and O. F. HASLBAUER (*Jour. Tenn. Acad. Sci.*, 21 (1946), No. 1, pp. 72-75).—Investigations on Norris Reservoir of the Tennessee Valley Authority demonstrate that the crop of this fish can be harvested in winter by limited use of fill nets, and that the nets would take but few fish of other species; the findings are presented briefly.

Studies on Iowa spiders, K. A. STILES and D. H. LUBER (*Iowa Acad. Sci. Proc.*, 51 (1944), pp. 473-484, illus. 7).—The authors believe that this report includes many of the more common species of the State and therefore should be of special aid to high school teachers and pupils. The families as well as the species are briefly described.

An annotated list of the spiders of Maryland, M. H. MUMA (*Maryland Sta. Bul.* A38 (1945), pp. 65+, illus. 15).—This report lists over 400 species of spiders from the State. A foreword is by W. B. Kemp.

Feeding chemicals to plants and animals for pest control, R. C. ROARK (U. S. D. A.). (*Jour. Econ. Ent.*, 39 (1946), No. 1, pp. 35-38).—A brief critical review (12 references) of studies of internal medication of animals against parasites and injections of chemicals into plants against insects and fungi, summarizing some of the unsuccessful earlier work and the promise of success from more recent investigations. The "findings open up a field of research that has scarcely been touched during the past 20 yr. and which promises to yield results of great value."

Factors influencing the interaction of insecticidal mists and flying insects.
—II, The production and behaviour of kerosene base insecticidal spray mists and their relation to flying insects, W. A. L. DAVID (*Bul. Ent. Res.*, 37 (1946), No. 1, pp. 1-28, illus. 1).—In this contribution (*E. S. R.*, 95, p. 356) a theoretical discussion and review (17 references) is followed by an account of the experimental work, the aim being—through the methods and apparatus described—to obtain a reasonably comprehensive picture of a unit of the atmosphere to which the flying insect is exposed. The size of the particle in mist—once it has left the spray gun—is largely determined by its ability to evaporate, as expressed chiefly by its size, vapor pressure, and the quantity of vapor already present in the surrounding atmosphere. The evaporation rate of the droplets is greatly depressed even when the atmosphere is very far from being saturated. If the spray contains materials of low vapor pressure the percentage of these present determines the ultimate particle size. The effect of changing the spraying pressure on the particle size in the mist is largely masked by precipitation and evaporation. The difference in particle size in the mist obtained with odorless kerosene and white oil (P 31) when sprayed through the same gun at the same pressure is largely an expression of the greater rate of evaporation of the former. The more quickly the carrier evaporates the smaller the particle recovered and the greater the quantity of any nonvolatile material present in the original spray remaining in suspension in the air space.

When nonvolatile material is present in the spray this—by failing to evaporate—determines the ultimate particle size in the mist. When the volume of a volatile spray injected into the chamber is increased, evaporation of the droplets is depressed so that they persist longer at a greater size level and so deposit more easily and are more readily impacted. The number of particles per unit volume of air space decreases with time, and a much greater number remains at a countable size when an appreciable quantity of nonvolatile material is incorporated in the spray. Wherever the attempt has been made, it has proved possible to show that a decrease in the quantity of spray mist in suspension in the atmosphere and a decrease in particle size in the mist as measured by the sampling devices used are attended by corresponding reductions in the insecticidal efficiency of the mist as measured on the yellow fever mosquito. In assessing the insecticidal efficiency of a mist it is not sufficient to know the quantity of insecticide in suspension in the atmosphere; the particle-size distribution must also be known. It is emphasized that the biological tests reported were all carried out on the yellow fever mosquito, and that the results may not be applicable to other insects without modifications.

Azobenzene as an acaricide and insecticide, R. C. HARING (*Jour. Econ. Ent.*, 39 (1946), No. 1, pp. 78-80).—Commercial parasiticides using azobenzene as the active ingredient have been developed; these, like other parasiticides, are specific in action. Use of dusts containing 20 percent of azobenzene in whiting or bentonite resulted in the complete control of several species of economically important pests. These dusts are particularly effective against red spider mites and the Mexican bean beetle, which have hitherto been difficult to control.

The new insecticides D. D. T. and benzene hexachloride and their significance in agriculture, H. SHAW (*Jour. Roy. Agr. Soc. England*, 106 (1945), pp. 204-220).—The author presents a review (66 references) of the history and present status of DDT and 666, with the conclusion that much remains to be done in the way of devising the most suitable combinations for par-

ticular purposes, determining the minimum concentrations for effective control, and observing their cumulative effects on the general fauna of treated areas. These materials have opened up entirely new possibilities in insect control, but have at the same time brought in potential dangers. It is thus essential that the first few years of their commercial use should be regarded as an extension of the experimental phase and entered into with a willingness to accept and act on the findings of careful and reliable observations. "There is little doubt that if such a rational outlook is maintained toward the development of these materials, they are capable of facilitating perhaps the greatest single step forward that man has ever made in his unending contest against the insect world."

Studies on the toxicity of DDT for domestic and laboratory animals, H. KONST and P. J. G. PLUMMER (*Canad. Jour. Compar. Med. and Vet. Sci.*, 10 (1946), No. 5, pp. 128-136, illus. 1).—Toxicological studies of commercially pure DDT indicated its acute toxicity to large domestic animals to be lower than for laboratory animals. In the laboratory species tested, higher toxic levels were obtained after oral administration than after subcutaneous injection; oil solutions proved more toxic than aqueous suspensions. Variations in species susceptibility were usually well marked; individual variations remained within limits which permitted the grouping according to drug susceptibility. Of the animals tested, rats exhibited the highest susceptibility; guinea pigs and swine, the greatest resistance. Mice, rabbits and chickens, cattle, goats, and sheep occupied intermediate positions, their resistance increasing in the approximate order given. No symptoms were induced by feeding DDT-dusted cabbage leaves and sprayed apple parings to rabbits, guinea pigs, and rats, or by feeding flies knocked down by a DDT spray to chickens. Gross pathological changes after single large doses occurred mainly in the liver; in the chronic toxicity tests there were no changes. The histological findings were similar in the acute and chronic toxicity tests, the difference being only in the degree of severity; the principal lesion was a degeneration of the liver.

The present status of D. D. T. as an insecticide, G. A. H. HELSON and D. F. WATERHOUSE (*Jour. Austral. Inst. Agr. Sci.*, 11 (1945), No. 4, pp. 172-178).—This summary of present knowledge on DDT is discussed under the forms in which it may be used, methods of application, and toxicity to insects, higher animals, and plants.

DDT residual-type sprays as affected by light, A. W. LINDQUIST, H. A. JONES, and A. H. MADDEN. (U. S. D. A.). (*Jour. Econ. Ent.*, 39 (1946), No. 1, pp. 55-59).—Boards, petri dishes, and glass plates sprayed with DDT solutions, emulsions, and suspensions were exposed to ultraviolet light and to sunlight, duplicate treatments being unexposed as checks. In the DDT solutions 15 percent of various auxiliary solvents were included. Exposure to either type reduced the effectiveness in most cases, as shown by the time required for knock-down of houseflies. With several high-boiling auxiliary solvents, however, this reduction was particularly severe. It appears from the findings that in general, where decomposition by light may be a factor, auxiliary solvents used in conjunction with kerosene in DDT residual sprays should not only be good solvents for DDT but should be of the boiling range of kerosene or lower. Solvents of very low flash point should be avoided. Xylene emulsions and aqueous suspensions were less affected by light than solutions.

Correlation between the possession of a chitinous cuticle and sensitivity to DDT, A. G. RICHARDS and L. K. CUTKOMP. (Minn. Expt. Sta. et al.).

(*Biol. Bul.*, 90 (1946), No. 2, pp. 97-108).—A correlation is said to exist among animals between the presence of a chitinous cuticle and susceptibility to external applications of DDT. Aquatic animals with such a cuticle (arthropods and certain coelenterates) are highly susceptible; others are less so, though there is considerable variability. This correlation is supported by studies on various coelenterates on adsorption, and on temperature coefficients. Coelenterata with a complete, partial, and no chitinous perisarc, respectively, are highly sensitive, somewhat so, and nearly insensitive to DDT, which can be adsorbed by chitin and chitinous cuticles and at low concentrations has a negative temperature coefficient for toxicity to arthropods. From such findings the hypothesis is proposed that chitinous cuticles facilitate the entry of DDT into the animal body by selectively concentrating the compound by adsorption phenomena. This is believed to be the first demonstration that an insecticide can be adsorbed by chitinous cuticles and the first direct evidence that such adsorption actually plays a role in insecticidal action. The nature of the toxicity of DDT to protoplasm is not here considered, the data presented referring only to the selective action of DDT as a function of penetration facilitated by chitinous exoskeletons. The shift to a positive temperature coefficient at higher concentrations, the lack of effect from injecting DDT emulsions into snails, and the variability in median lethal doses for injected DDT emulsions in different animals all indicate that the selective adsorption of DDT by chitinous cuticles is only part of the story of the toxic action of this compound.

DDT and its effect on fish and wildlife, C. COTTAM (*Jour. Econ. Ent.*, 39 (1946), No. 1, pp. 44-52).—Observations of the effects on wildlife of DDT used for insect control were made in 12 States and the Province of Ontario; fair to successful insect control was obtained. The principal investigations were on forest lands in Maryland and Pennsylvania. Applications were made chiefly by airplane as an oil spray, concentrations being 0.2 to 5 lb. per acre; the greatest amount used anywhere was 25 lb. per acre as a dust. The amount of DDT actually reaching the vegetation varied considerably from the specified rate of application owing to bad weather, lack of landmarks, defective apparatus, and differing density of vegetation. The mortality in wildlife was pronounced from use of most of the higher, but was slight or inapparent from most of the lower, concentrations. Invertebrates and cold-blooded vertebrates were more readily affected than birds and mammals. In the single trial involved, DDT was far more toxic in emulsion than when applied in oil or as a suspension. Recommendations on the basis of the findings are: Don't use DDT unless you must, always use minimum necessary dosages, apply carefully, leave a sanctuary, time the application, avoid spraying water, and watch what happens. These are each discussed briefly.

Investigation on the locus of action of DDT in flies (*Drosophila*), D. BODENSTEIN (*Biol. Bul.*, 90 (1946), No. 2, pp. 148-157, *illus.* 3).—Larvae and adults of *D. virilis* were fatally poisoned by injecting a 1-percent DDT emulsion into the abdominal cavity; this produced a typical symptom pattern. The neuromuscular system of the wings and legs appeared very sensitive to DDT, going into spasm long before the muscles of the abdominal wall. There was also a difference in sensitivity between larvae and adults, the former proving more resistant. Phenobarbital was also found to affect the nervous system; paralysis was induced in the absence of the central ganglia, showing that this drug likewise affects the peripheral nerves. The muscles of larvae treated with phenobarbital respond to mechanical stimulation. Since DDT produced no symptoms in individuals treated with phenobarbital

and those treated with DDT lost their DDT symptoms when injected with phenobarbital, it is clear that DDT acts on the nervous system. Moreover, body parts isolated from the central nervous system and then treated with DDT stopped convulsing after phenobarbital administration, indicating that DDT affects the peripheral nerves. Though the methods used did not allow determination of what part of the peripheral nervous system might be affected, three possibilities are suggested, viz, the poison might affect (1) the motor nerves leading to the periphery, (2) the myoneural junctions, or (3) the peripheral nerve net. It is believed still questionable, however, whether such a nerve net exists in *Drosophila*. The antagonistic effect of phenobarbital was clearly shown by the fact that the spasm of the legs and wings in DDT-treated flies was partly relieved by phenobarbital treatment. The conception that only the nervous system is affected by DDT is strengthened by the fact that larval organs (imaginal disks) exposed to DDT for 20 hr. grew and differentiated normally when transplanted into untreated larvae.

Protection of plants from black beetle by DDT applied to the soil, C. R. WALLACE (*Jour. Austral. Inst. Agr. Sci.*, 11 (1945), No. 3, pp. 135-139, illus. 1).—It is clear that the DDT treatments on marigolds and during the first 3.5 weeks after setting out cauliflower plants will enable the grower to secure sound crops in the face of severe attacks by the dynastid beetle *Heteronychus sanctae-helenae* Blanch. Its range of host plants is, however, extremely wide and there are indications that at least one of these hosts (tomato) might react adversely to certain dosages of DDT in the soil. As to the last factor, much more needs to be known on the rate of break-down of DDT under soil conditions.

DDT knocks insects that plague farmstead, R. H. DAGGY (*Minn. Farm and Home Sci.* [Minnesota Sta.], 3 (1946), No. 3, pp. 6-7, 10-11, illus. 2).—An evaluation of the uses of DDT for farm and home on the basis of present knowledge of this insecticide.

Toxicity of D. D. T. to man, F. M. G. STAMMERS and F. G. SAREL WHITFIELD (*Nature*) [London], 157 (1946), No. 3994, p. 658).—The clinical and special investigations and general demeanor and labor output of men engaged in spraying ships and shore establishments against mosquitoes indicated that no ill effects had been incurred from prolonged exposure of the skin to the DDT solution and from working in confined spaces in a mist of the spray.

[DDT and lead arsenate-phenothiazine sprays] (*Pennsylvania Sta. Bul.* 475 (1946), Sup. 1, pp. 1-6+, illus. 2).—The following brief articles are included: DDT Not a New Chemical—New Only as Insecticide, by D. E. H. Frear (pp. 1+); Insect Control Demonstrations with DDT in Pennsylvania, by J. O. Pepper (pp. 1-2); DDT Controls Codling Moth, Allows Mites to Increase, by H. M. Steiner (pp. 2-3); DDT Effectively Controls Grape Insects in 1944-45, by J. A. Cox (pp. 3-4); DDT in Combination Sprays Increases Yields of Potatoes, by H. W. Thurston, Jr. (p. 4); DDT Less Harmful to Bees Than Apiarists Have Feared, by E. J. Anderson (p. 4); and Lead Arsenate-Phenothiazine Spray Helps Prevent Codling Moth Outbreak, by H. M. Steiner (pp. 5-6).

A study of stickers for lead arsenate sprays on fruit trees, P. GARMAN (*Connecticut [New Haven] Sta. Bul.* 485 (1945), pp. 105-161, illus. 21).—Laboratory and orchard experiments led to the following conclusions: Lead arsenate alone sticks better than lead arsenate plus dry flotation sulfur or plus flotation sulfur and lime. Lead arsenate plus lime shows improved adhesion over lead arsenate alone on glass slides but not on foliage—espe-

cially at high concentrations. Oils are good deposit builders; they are also good stickers, but the amounts used should be in proportion to the amount of solids in the spray mixture. Bentonite plus 20 percent skim milk or casein is an excellent sticker, second only to the oils; in the dry 1944 season, it equalled the oils in field experiments. Aluminum gel is also a good sticker, and various compounds utilized in these experiments evidently produce some form of aluminum gel. Aluminum gels, including bentonite, acts as safeners for both oil and lead arsenate, thereby preventing foliage burn even though the arsenic is retained on the leaves in large amounts over a long period of time. By utilizing stickers that are good deposit builders and safeners as well, the total number of sprays needed may be reduced considerably in seasons such as 1943 and 1944.

The advantages of the reduced schedules in Connecticut appear to lie in improved control of European red mite and apple maggot, as well as reductions in spray russet, foliage burn, and drop. There are also savings in labor, gasoline, and depreciation of machinery. The main objections lie in the difficulty of handling the complex mixtures and the rather poor control of curculio in bad years. Supplementary treatments may be needed in certain seasons, but these should not detract from the value of the method. Curculio control in 1944 was as good as or better than that obtained with the standard spray schedule. Although no difficulty in controlling codling moth has followed use of the reduced programs and increased dosages of lead arsenate, the method is not yet recommended when codling moth becomes a threatening factor in Connecticut fruit production. It is believed that reduced programs, such as those described, may have a definite place in the State for such varieties as Baldwin, Wagner, Stayman, or similar varieties. The method has not been tested sufficiently in wet years to warrant present recommendation for scab-susceptible varieties.

Involvements in research in present day economic entomology, D. L. VAN DINE (*Jour. Econ. Ent.*, 39 (1946), No. 1, pp. 1-5).—Presidential address, fifty-seventh annual meeting, American Association of Economic Entomologists.

Entomological nomenclature and literature, W. J. CHAMBERLIN (*Ann Arbor, Mich.: Edwards Bros.*, 1946, 2 ed., pp. 135+, illus. 2).—In this edition, a third part on preparing articles for scientific publication has been added (E. S. R., 86, p. 806).

Catalogo de los insectos que atacan a las plantas economicas de Cuba [Catalog of the insect and other arthropod pests of crop plants in Cuba], S. C. BRUNER, L. C. SCARAMUZZA, and A. R. OTERO (*Habana: Cuba Estac. Expt. Agron.*, 1945, pp. 264+, illus. 76).

Influence of soil minerals on insects, L. HASEMAN. (Univ. Mo.). (*Jour. Econ. Ent.*, 39 (1946), No. 1, pp. 8-11).—These investigations—begun some years ago and thus far largely of an exploratory nature—have included the green bug, chinch bug, greenhouse thrips, greenhouse white fly, and Colorado potato beetle. In general, it was the plants grown on the lower N levels that were most attractive to these pests. As with the higher animals, for optimum development and reproduction each insect appears to have its specific nutritional requirements which, according to these findings, would seem to vary greatly as far as minerals are concerned from those of man and other vertebrates. The indications are that insects require less of minerals and that they actually thrive best on shortages of certain ones. It is believed probable that different crop pests will vary as to which minerals they require in reduced quantities; it would seem, however, that by lowering the total level

of soil minerals through erosion, overcropping, and faulty rotations, conditions are being systematically improved for insect pests while at the same time they are becoming less and less favorable for crops, livestock, and man. Soil improvement, as well as insecticides, would seem to be indicated.

[Notes on insects and insecticides] (*Jour. Econ. Ent.*, 39 (1946), No. 1, pp. 81-94).—Contributions presented (E. S. R., 95, p. 77) are Benzene Hexachloride to Control Bugs on Cotton, by W. A. Stevenson and L. W. Sheets (p. 81) (U. S. D. A.); Mosquito Collections at Army Installations in the Fourth Service Command, 1943, by S. J. Carpenter and R. W. Chamberlain (pp. 82-88); The Control of the Blueberry Bud Mite [*Eriophyes vaccinii* K.], by J. S. Bailey and A. I. Bourne (p. 89) (Mass. Expt. Sta.); Collections of Mosquitoes on Parris Island During 1945, by G. H. Bick (pp. 89-91); DDT and Hornfly Populations, by L. M. Peairs (pp. 91-92) (W. Va. Sta.); DDT to Control the Winter Horse Tick [Brown Winter Tick], by H. E. Parish and C. S. Rude (pp. 92-93) (U. S. D. A.); and Sulfur as an Aphicide, by D. Isely and F. D. Miner (pp. 93-94) (Ark. Sta.).

The economic importance of dragonflies (Odonata), M. WRIGHT (*Jour. Tenn. Acad. Sci.*, 21 (1946), No. 1, pp. 60-71).—On the basis of the literature (29 references) and on independent studies, the author discusses both the beneficial and harmful aspects of dragonflies. These insects are taken as food by many species of fish, but constitute a major dietary item only in certain species, such as trout and bass, which are animal feeders. The nymphs constitute an important part of the diet of ducks and other birds feeding in aquatic areas on animal rather than plant food. Flies, mosquitoes, and gnats are eaten by practically all species of Odonata, and especially when these pests occur in large populations. The available information indicates that although large numbers of the pest insects are destroyed by dragonflies, little or no effective control is effected. Two dragonflies—*Anax junius* and *Coryphaeschna ingens*—have been shown to be destructive to both queen and worker bees in the Southeastern States. Nymphs of certain of the larger dragonflies capture and eat small fish; when these species are present in large numbers, particularly in hatchery ponds, considerable destruction of fish occurs, often resulting in 50 percent or greater losses in population. It is emphasized that the greater number of dragonfly species are not thus involved, but are themselves fed upon by larger fish. The nymphs and adults serve as intermediate hosts for a considerable list of flukes, and probably will be shown to be important vectors of many such parasites of aquatic vertebrates that feed on members of the dragonfly group.

Diapause in *Scelio chortoitcetes* Frogg. (Scelionidae), a parasite of the eggs of *Austroicetes cruciata* Sauss., L. C. BIRCH (*Jour. Austral. Inst. Agr. Sci.*, 11 (1945), No. 4, pp. 189-190).—A note on this parasite of Australian plague grasshopper eggs.

The use of transport and poison bait in a locust campaign, R. J. M. SWYNNERTON (*East African Agr. Jour.*, 11 (1946), No. 4, pp. 224-230).—The author presents notes compiled as a result of a locust control campaign in Tanganyika (1944) in which the "hoppers" were already hatched before it was possible to organize the assembly of equipment. It was believed that the information obtained might be of use to others having the responsibility of organizing similar campaigns at short notice. Summaries are given of the plan of campaign, equipment, behavior of the hoppers, supply and preparation of poison bait, baiting organization, methods and rates of baiting, observations of results, arsenical poisoning, and mechanical methods of hopper destruction.

A list of the Chloropidae (Diptera) known to occur in Iowa, L. REDLINGER and H. E. JAKES (*Iowa Acad. Sci. Proc.*, 51 (1944), pp. 471-472, illus. 1).—The chief purpose of this brief paper is to list the known Iowa species of these frit flies.

The Nearctic species of *Iteaphila* and *Apalocnemis*, A. L. MELANDER. (Univ. Calif.). (*Bul. Brooklyn Ent. Soc.*, 41 (1946), No. 2, pp. 29-40, illus. 3).—In these two dipterous genera, six new species are described for *Iteaphila* and two for *Apalocnemis*, with keys for identification.

Light-trap studies of the Clear Lake gnat, A. W. LINDQUIST and C. C. DEONIER. (U. S. D. A.). (*Jour. Econ. Ent.*, 39 (1946), No. 1, pp. 11-14, illus. 2).—In studies of the relative attractiveness of lights of various intensities and wavelengths to the Clear Lake gnat, it was found that with filament lamps the numbers taken per unit of light decreased inversely with the intensity. A 500-w. lamp took only a little over 2.3 times as many as a 100-w. lamp. A double-action trap, in which one 150-w. lamp was placed over the motor and another below, captured nearly twice as many gnats as a single-action trap fitted with a 300-w. lamp suspended above the motor. A 15-w. daylight fluorescent lamp attracted 2.33 times as many as a 60-w. filament lamp and took over 6 times as many gnats per watt. Trials with larger fluorescent lamps and regular filament lamps indicated that—on an equal lumen-rating basis—the former captured more gnats than the latter and up to 7.33 times as many per watt. Daylight and blue fluorescent lamps attracted about the same number of gnats, but on the basis of numbers captured per lumen the blue lamp was considerably better. Daylight fluorescent lamps were more efficient than the white, pink, green, or red.

Life histories and ecology of Iowa midges (Tendipedidae).—I, The genus *Tanytarsus*, U. A. HAUBER (*Iowa Acad. Sci. Proc.*, 51 (1944), pp. 451-461, illus. 30).—Some 11 entities are described and assigned to this genus; "the group has had little attention in this country and there are few types available for comparison. Under the circumstances any attempt to classify specimens is done subject to future corrections."

Check list of the Cicadellidae (Homoptera) of America, north of Mexico, D. M. DELONG and D. J. KNULL (*Columbus: Ohio State Univ. Press*, 1945, pp. 102+).—In addition to the annotated check list of the leafhopper family, a key list of publications, suggested generic papers on North American Cicadellidae, and an index to the genera are included.

A new genus (*Costamia*) and species of Mexican leafhopper (Homoptera: Cicadellidae), D. M. DELONG. (Ohio State Univ.). (*Ann. Ent. Soc. Amer.*, 39 (1946), No. 1, pp. 82-83, illus. 3).—*C. venosa* n. gen. and sp. are described and illustrated.

A preliminary report on the Geometridae of Iowa, E. JERREL and H. E. JAKES (*Iowa Acad. Sci. Proc.*, 51 (1944), pp. 463-465, illus. 2).—A listing of the geometrid moths reported from the State.

Undescribed species of *Tipula* from western North America (Diptera: Tipulidae), II, C. P. ALEXANDER. (Mass. State Col.). (*Bul. Brooklyn Ent. Soc.*, 41 (1946), No. 2, pp. 45-51).—Three more new species (E. S. R., 93, p. 602) are described.

Descriptions of new genera and species of Mymaridae (Hymenoptera: Chalcidoidea), A. A. OGLOBLIN. (Iowa Expt. Sta.). (*Iowa State Col. Jour. Sci.*, 20 (1946), No. 3, pp. 277-295, illus. 19).—The following six new chalcid fly genera, with species thereunder, are described: *Chaetomymar*, *Tetrapolynema*, *Barypolynema*, *Acmapolynema*, *Platystethynium*, and *Platypatasson*. A new species of *Lymaenon* is also included.

Insect pollinators of alfalfa in California, E. G. LINSLEY. (Univ. Calif.). (*Jour. Econ. Ent.*, 39 (1946), No. 1, pp. 18-29).—From the information obtained in surveys of alfalfa seed fields in four California areas (1945), the following conclusions are drawn: The only significant insect pollinators of alfalfa appear to be bees; no other insects were observed to trip the flowers deliberately, although a species of wasp tripped and cross-pollinated mechanically in the Palo Verde Valley. In each of the areas concerned in this study, the major portion of the tripping and pollination was done by wild bees; in the Palo Verde Valley 12 species were thus observed, and among them *Nomia peninsularis* Ckll. was the most abundant, being found in every field. In the Hemet Valley, 19 species were found; among them, *Melissodes timberlakei* Ckll., various species of *Megachile*, *N. melanderi* Ckll., and *Anthidium edwardsii* (Cress.) were probably the most important, but no single species was found in every field. In the northwestern part of the San Joaquin Valley, 14 species were encountered; among them *Melissodes timberlakei* appeared by far the most important, followed closely by *Megachile brevis* Say, *M. onobrychidis* Ckll., and *A. edwardsii*. In the delta area of the Sacramento Valley, 13 pollinators were found; of these, *Melissodes timberlakei* and *Megachile* spp. were again the most important. Honeybees were present in varying numbers in all the fields, but both the percentage and total numbers of pollen collectors compared unfavorably with the solitary bees. Bumblebees, though individually more efficient than honeybees, were usually not abundant enough to be regarded as important for alfalfa pollination.

A report on the status and control of insect pests of cotton in the Lower River districts of Nyasaland, E. O. PEARSON and B. L. MITCHELL (*Zomba: [Dept. Agr. Nyasaland], 1945, pp. 48+, illus. 7*).—"This report deals with the causes of the great fluctuations in production of cotton in the area of Nyasaland known as the Lower River, and is the result of work carried out by the entomological staff of the Empire Cotton Growing Corporation in this country since 1938."

Benzene hexachloride to control cotton insects, E. E. IVY and K. P. EWING. (U. S. D. A. coop. Tex. Expt. Sta.). (*Jour. Econ. Ent.*, 39 (1946), No. 1, pp. 38-41, illus. 1).—In laboratory and cage tests at Waco, Tex., benzene hexachloride dust gave excellent results with several important cotton insects. Control of the boll weevil and cotton leafworm was better than with calcium arsenate. Its effectiveness against the cotton flea hopper, tarnished plant bug, and southern green stinkbug was equal to or better than that of DDT. Better control of the cotton aphid was obtained than with nicotine dusts, but DDT and heavy dosages of calcium arsenate dusts each gave better bollworm control than benzene hexachloride.

Cooperacion entre los Estados Unidos de Norteamerica y la Republica de Mexico, para el control del gusano rosado del algodono [Cooperation between the United States and the Republic of Mexico on the control of the pink bollworm of cotton], A. DELGADO DE GARAY (*Jour. Econ. Ent.*, 39 (1946), No. 1, pp. 95-98).

Factors involved in the separation of *Macrocentrus ancyliivorus* cocoons from tuber worm pupae, C. H. MARTIN and G. L. FINNEY. (Univ. Calif.). (*Jour. Econ. Ent.*, 39 (1946), No. 1, pp. 29-35).—These studies revealed that, with proper precautions, there is no mortality of the stages of *M. ancyliivorus* Rowher in the cocoons as a result of freeing them from host cocoons and separating them from host pupae. Such precautions include elimination of mechanical factors by sanding the cocooning trays and proper use of a trap-bottomed vessel for freeing and separation of the parasites from the hosts.

Toxicity factors are avoided when only stable solutions of sodium hypochlorite are used for freeing and alcohol with a specific gravity of 0.920 B. is used for separation. Since the parasites must be separated from the host pupae before the latter float, superparasitized host larvae are lost, although the parasites would eventually have emerged from them. Superparasitism can be reduced by exposing the hosts for 3 days. Freeing and separating the parasites is done when the host cocoons are 6 to 7 days old. The date of freeing depends on the time when 75 percent of the parasites have pupated.

The pickleworm: Cucurbit enemy No. 1, B. B. FULTON (*Res. and Farming* [North Carolina Sta.], 4 (1946), *Prog. Rpt.* 2, pp. 6-7, 10, illus. 1).—The pickleworm is said to rank first in North Carolina among the insect enemies of the cucumber family. This contribution outlines the life history of the pest and summarizes methods of control through avoidance and dusting as based on work by the station. By early planting the crop may be matured before the arrival of the insect. The best insecticide against it was found to be cryolite—either synthetic or natural; detailed procedures for its use are presented.

Susceptibility of hibernating codling moth larvae to low temperatures, and the bound-water content, E. H. SIEGLER. (U. S. D. A.). (*Jour. Agr. Res.* [U. S.], 72 (1946), No. 10, pp. 329-340, illus. 7).—The author investigated the bound-water content of hibernating larvae of the codling moth and their susceptibility to low temperatures as shown by the temperature to which they could be cooled before beginning to freeze. Unlike some insects, the codling moth fails to withstand more than one freezing. The overwintering larvae show pronounced tendency to undercool; the average undercooling temperatures for different groups ranged from -24.4° to -30.1° C.; the average rebound temperatures to which the temperatures of the insects rose after freezing had started ranged from -5.0° to -11.2° . No marked differences in susceptibility to low temperatures—as indicated by undercooling temperatures—were shown by larvae from Washington, Colorado, Arkansas, Maryland, and Georgia. The undercooling temperatures of the larvae were practically unaffected by sex or weight, nor did exposure to artificially created dry and humid conditions indicate any marked changes in this respect. The undercooling temperatures of crossbred larvae were similar to those of their progenitors. Undercooling is favored by the quiescent state during hibernation; artificial movement of the larva greatly reduced the undercooling. The average bound-water content of the larvae was 35.9 percent when determined by the dilatometric method at -7.5° and 11.2 percent by the heat-of-fusion-of-ice method at -30° .

Notes on the time of emergence, longevity, and oviposition of codling moth from walnuts, apples, and pears, A. J. BASINGER and H. S. SMITH. (Calif. Citrus Expt. Sta.). (*Calif. Dept. Agr. Bul.*, 35 (1946), No. 1, pp. 37-38).—The codling moth has in recent years become an important pest of Persian walnuts in California, suggesting that a new race may be in process of development. To study this question, larvae were procured from apples and pears in different localities during the fall (1940) and taken to Riverside for emergence. No significant differences occurred in the emergence time of adults from the various localities except in those from the Stockton district, where—though it is 300 miles north of the other areas—emergence was distinctly earlier. Furthermore, in this locality emergence was slower from walnuts than from apples; in the southern part of the State emergence from the two hosts was almost coincident except at the Whittier-Downey district,

where that from walnuts came first. The length of life of moths from the various localities and from the two hosts was fairly close.

An effective method of controlling codling moth in Oklahoma orchards, F. E. WHITEHEAD (Okla. A. and M. Col.). (*Jour. Econ. Ent.*, 39 (1946), No. 1, pp. 69-76, illus. 1).—The author suggests that the plan of orchard planting in which all varieties are mature and harvested by August 15 would greatly reduce the codling moth problem in Oklahoma. Pupation and hibernation records of larvae collected from trees grouped according to their date of ripening indicate that only approximately 9 percent of the total hibernating population had entered hibernation by August 15, and that less than 2 percent hibernated on the trees maturing fruit by August 15. The plan is considered inexpensive and practical for Oklahoma conditions, because it costs no more to set out this type of orchard and early apples are more economically produced and normally bring higher prices. The author admits that, with the present information, the proposed plan is based to a considerable extent on theory. Plans are already under way, however, which it is hoped will give more complete information than that now available.

Development of the immature stages of *Anastrepha serpentina* in relation to temperature, J. G. SHAW and D. F. STARR. (U. S. D. A.). (*Jour. Agr. Res. [U. S.]*, 72 (1946), No. 8, pp. 265-276, illus. 6).—Since *A. serpentina* (Wied.) is known to develop in several economically important fruits and has appeared in the lower Rio Grande Valley of Texas as a threat to the citrus industry, a study of the development of the immature stages was undertaken at the Mexico City laboratory. First oviposition occurred 16 days after the flies began to emerge from puparia. Eggs were procured from confined flies by exposing arcs of fruit skins fastened by paraffin to glass plates. The fact that this fruitfly preferred chicozapote skins to peach skins for oviposition proved highly significant. Eggs for incubation and hatching studies were held in Syracuse watch glasses in cabinets at 10° to 37.8°C.; hatching occurred at 15° to 32.5°. The incubation period covered 361 to 645 hr., after which the hatching process approximated a straight line when the probit of the cumulative percentage of hatch was plotted against the logarithm of time. The temperature effect on the reciprocal of the incubation period and on the rate of hatch was measured so that approximate hatching curves might be calculated between 15° and 30°.

The larvae were reared at 15° to 32.5° by placing them in slices of fruit held between glass plates. Mealy-ripe chicozapote provided the better medium for larval development, but peach was also used. Molting of the first instar was observed in some detail. The second stadium was generally shorter than the first, but the third was considerably longer than either of the others. In peach, the larvae developed in 50 to 17.4 days at 15° to 30°; in chicozapote, in only 41.5 to 11.7 days at the same temperature range and in 11 days at 32.5°. The holding and care of puparia in crystallization dishes is described, the developmental time proving nearly the same for those formed from larvae fed on peach and on chicozapote. The development from egg to adult ranged from 121 days for one individual reared in peach at 15° to 26 days for individuals reared in chicozapote at 30° and 32.5°; development in peach was invariably longer, the difference being in the feeding or larval stage. When the rate of development in each fruit—measured by the reciprocal of time in days—was plotted against temperature, linear regression lines were produced.

DDT to control bugs that cause deformed peaches, O. I. SNAPP. (U. S. D. A. coop. Clemson Agr. Col. et al.). (*Jour. Econ. Ent.*, 39 (1946), No. 1, pp. 41-43, illus. 1).—Deformed peaches caused by sucking bugs are respon-

sible for a large part of the culls in many South Carolina orchards. The tarnished plant bug was found on peach trees in Spartanburg County orchards from full bloom until petal fall, and available evidence indicates it to be largely responsible for the deformed peaches in that area; other bugs were present in very small numbers only. Preliminary tests showed that jarring cannot be depended on to control these pests, but that DDT might give control; in subsequent large-orchard tests, a single application at full bloom reduced the injured peaches at harvest from 42.4 to as few as 7.8 percent. The results showed little difference in plant bug control from 5 to 10 percent DDT dusts, used at the rate of about 0.2 lb. per tree, or DDT sprays at strengths of 1 or 2 lb. of the technical material per 100 gal. of spray, used at the rate of about 1.5 gal. per tree. There was no difference in the degree of control of sucking bugs from 5 percent DDT dust whether or not the fruit had been thinned.

Timing spray applications to control the pecan nut casebearer, W. C. PIERCE. (U. S. D. A.). (*Jour. Econ. Ent.*, 39 (1946), No. 1, pp. 76-78).—It appears from the data presented that there may be sufficient correlation between the blossoming stages on certain varieties and the time when the pecan nut casebearer eggs are deposited and hatch to serve as a basis for determining spray dates for its control. The time at which 85 to 100 percent of the catkins had dropped from the varieties Burkett, Eastern Schley, and Mahan more nearly indicated the time to spray than when certain other varieties developed receptive stigmas. The method of determining the beginning of stigma receptivity is, however, simple and under some conditions it may be desirable to use these observations. Pending further study, it is suggested that the spray applications be timed to begin 4 to 8 days after 85 percent or more of the catkins of these varieties are shed. Observations may be made on the abundance of first-generation eggs in the orchard for determining whether to begin spraying on the fourth or the eighth day. Under Texas conditions the sprays should usually be applied during the second week after the shedding of 85 percent or more of the catkins; approximately 25 trees in different parts of the orchard should be used to determine this time. It is believed possible to substitute other varieties of the protogynous group for those presented here, provided the proper adjustments are made for differences in time of shedding pollen.

Tolerance of citrus fruits to methyl bromide as a fumigant, H. M. ARMISTAGE and J. B. STEINWEDEN (*Calif. Dept. Agr. Bul.*, 35 (1946), No. 1, pp. 21-29, illus.).—Lemons and California Bearss limes were uninjured by any of the methyl bromide dosages used. Grapefruit were uninjured by minimum dosages at which 100 percent kill of California red scale can be secured with this chemical, but were marked and discolored by higher concentrations. Washington Navel oranges became spotted or discolored at all dosages used—even below the lethal level for the scale. The injury was slow to appear and was manifested by a gradual breaking down of the oil cells and intercellular tissues, resulting in deep pits in the brown areas. California Bearss limes were uninjured by HCN fumigation when applied dry but—due to condensation water—even light schedules injured them when treated directly from a refrigerator. The red scale on citrus fruits was killed 100 percent by methyl bromide at 2.5 lb. per 1,000 cu. ft. at 80° and at 3 lb. per 1,000 cu. ft. at 70° F. Limited tests showed that the scale was killed with dosages of 15 cc., 20 cc., and 25 cc. per 100 cu. ft. for 1 hr., and extensive counts showed 100 percent kill with 25 cc.

DDT to control household and stored grain insects, J. J. DAVIS. (Ind. Expt. Sta.). (*Jour. Econ. Ent.*, 39 (1946), No. 1, pp. 59-61).—In this symposium paper the author presents a brief resumé of published results against stored grain and household insects, including mothproofing.

Tyroglyphid mites in stored products—ecological studies, M. E. SOLOMON (*Ann. Appl. Biol.*, 33 (1946), No. 1, pp. 82-97, *illus.* 4).—Manitoba grain stored in bulk in one granary was repeatedly examined over 15 mo., and corroborative data were obtained in other granaries. The chief mite pest of grain was *Tyroglyphus farinae* (L.); in imported grain it usually attacks only those parts of a bulk which have taken up extra moisture. *Glycyphagus destructor* (Schr.) is commonly found throughout the surface layer, but does no damage to the grain. Differences were found in the distribution and population density of *Tyroglyphus*, *Glycyphagus*, and the predatory mite *Cheyletus eruditus* Schr. in relation to the moisture content of the grain. *Tyroglyphus* was abundant in winter and spring, but was often reduced to very small numbers during fall and winter because of attacks by *Cheyletus*; the former multiplies less rapidly as the moisture decreases, so that under the drier conditions in stored grain during summer and fall *Cheyletus* is enabled to control it. A subsidiary factor was the migration of *Tyroglyphus* into somewhat drier grain after dense populations had exhausted the wheat germ; extremely high moisture occasionally appeared to cause similar migrations. The seasonal temperature difference may also have been a factor influencing the predator/prey cycle. *Cheyletus* survived in grain too dry for *Tyroglyphus*. The predator was also associated with *Glycyphagus*, but was usually unable to reduce its numbers to a comparable extent; it is also known to attack various insects.

Grain stored in bags has a much larger area exposed to atmospheric moisture; thus infestations tend to be more widespread than in bulk grain. It is important to keep the bags away from concrete floors. *Cheyletus* is less common in bagged grain and in flour. The findings regarding infestations of flour in bags were similar to those for bagged grain. Mites tended to concentrate in the more superficial flour, very few penetrating more than a few centimeters into the flour; this would facilitate fumigation. It appears possible that tyroglyphids—or at least their eggs—may survive the milling process. Dried fruits seemed to have become infested with *Carpoglyphus lactis* (L.) as a result of moisture increases. The most effective means of preventing infestation of stored products by mites is to keep them moderately dry; failing this, steps should be taken to prevent local increases in moisture. It might be useful under certain conditions to introduce *Cheyletus*—perhaps together with *Glycyphagus* as a source of food—into stored products to prevent the possibility of *Tyroglyphus* being introduced without its predators—e. g., after fumigation.

Analysis of concentration-survival time curves of arsenite-injected roaches having different resistances, J. F. YEAGER and S. C. MUNSON. (U. S. D. A.). (*Ann. Ent. Soc. Amer.*, 39 (1946), No. 1, pp. 145-151, *illus.* 2).—Analysis of previous data led to certain indications of the reasons why some cockroaches injected with a given dose of sodium metarsenite survived for short times, whereas others similarly injected survived longer. An interpretation of the results indicated that such differences in survival times are associated with and may be in part caused by (1) differences in the electrolytic dissociation of the poison in the insect blood, which may involve differences in the degree of dissociation at high concentrations, the rate of change in degree of dissociation with change in concentration, and the concentration at

which complete dissociation is attained; and (2) by differences in the capacity of the insect to render ineffective some of the poison received or in the amount of vital tissues, or differences in both. It is suggested that among the physiological factors that may be involved are blood volume and plasma chemical composition and processes of detoxification and excretion. The findings are also in accord with the idea that 'the mixing of the poison with, and its distribution by, the blood occur more slowly in those insects that have longer survival times.

Investigations at the Henry R. Carter Memorial Laboratory of the United States Public Health Service, S. W. SIMMONS (*Jour. Econ. Ent.*, 39 (1946), No. 1, pp. 15-17).—This laboratory at Savannah, Ga., is the technical development unit for supplying information on procedures, materials, formulas, and equipment for immediate practical field use. Its activities—here briefly summarized as to work, purpose, and significance—are divided into the nine units on anopheline residual sprays, anopheline larvicides, insect premise sanitation, equipment development, effects of DDT anopheline larviciding on wildlife, typhus control investigations, anopheline host preference studies, chemical investigations, and the insectary for producing large numbers of specimens for the various projects.

Histological effects of sesamin on the brain and muscles of the housefly, A. HARTZELL and E. WEXLER (*Contrib. Boyce Thompson Inst.*, 14 (1946), No. 3, pp. 123-126, illus. 1).—Sesamin was found to produce characteristic effects on the brain and striated muscles of moribund houseflies in a preliminary histological study of tissues stained with Delafield's hematoxylin and eosin Y. The principal effect was the vacuolation of the larger nerve cells of the brain and the accentuation of the nodes and Krause's membrane in the striated muscles. The effects of pure sesamin on brain and muscle tissues of the housefly were in general similar to those obtained with sesame oil. Histological evidence is presented that the active principle of sesame oil is sesamin.

The Bodian technic and the mosquito nervous system, W. M. ROGOFF (*Stain Technol.*, 21 (1946), No. 2, pp. 59-61).—Fixation of mosquitoes by Petrunkevitch's para-nitro-phenol fluid with 20 or 25 percent formalin allowed use of the Bodian activated protargol technic where other commonly employed fixing fluids were unsuccessful. Gold-toning with subsequent oxalic acid reduction proved necessary for culicid nerve tract preparations.

Identification of *Culex* males under low magnification, H. R. DODGE (*Ann. Ent. Soc. Amer.*, 39 (1946), No. 1, pp. 140-124).—The purpose of this study was to set forth characters whereby the ♂♂ of the 10 species of this mosquito genus occurring in Georgia can be distinguished by the low powers of the binocular microscope. An identification key is provided.

DDT emulsion applied to rice-field water to control mosquitoes, C. B. WISECUP, W. C. BROTHERS, P. M. EIDE, and C. C. DEONIER. (U. S. D. A. et al.). (*Jour. Econ. Ent.*, 39 (1946), No. 1, pp. 52-55).—Large-scale tests of the effectiveness of DDT in controlling *Anopheles* and *Psorophora* mosquito larvae were conducted during May 25-September 4, 1944, in rice fields near Stuttgart, Ark. A basic concentrate consisting of 20 percent of DDT, 60 percent of xylene, and 20 percent of Triton X-100—diluted with water to form emulsions of various strengths—was applied to flowing irrigation waters. Weekly surveys of 16 treatments on over 730 acres led to the following conclusions: The method is feasible for controlling mosquitoes in fields up to 70 acres in extent when the irrigation flow is about 1,000 gal. per minute. Treatments should be applied close to the point where the water

enters the field and at about 1 part DDT per million of water to insure long-lasting results. It is imperative, however, that more satisfactory equipment be developed for the application of DDT to flowing water. The emulsions used in these tests did not injure the current rice crop.

Aerosol formulation: Laboratory tests with pyrethrum and DDT aerosols against the common malaria mosquito and the housefly, A. W. LINDQUIST, B. V. TRAVIS, A. H. MADDEN, and H. A. JONES. (U. S. D. A.). (*Soap and Sanit. Chem.*, 22 (1946), No. 5, pp. 135-143, illus. 1).—In laboratory tests to find substitutes or adjuvants for pyrethrum in aerosols, promising results were obtained with DDT. Since the latter is only slightly soluble in dichlorodifluoromethane, it became necessary to find an auxiliary solvent. From the standpoints of availability, cost, odor, nonirritating properties, and non-toxicity to man, cyclohexanone was considered the best one tested; 10 percent of it plus 5 percent DDT in an aerosol formula caused a 24-hr. kill of the common malaria mosquito close to that obtained with a pyrethrum aerosol containing 0.4 percent of pyrethrins and 8 percent of sesame oil, and was far better than the pyrethrum aerosol against houseflies. Compared with pyrethrum, DDT gave a slower knock-down of both mosquitoes and flies. In contrast, however, a large percentage of flies recover after exposure to pyrethrum, whereas recovery seldom occurred after DDT exposure; recovery of mosquitoes from exposures to either DDT or pyrethrum was negligible. To increase the speed of knock-down of the 5 percent DDT formula, 0.2 percent of pyrethrins was added; this combination proved highly effective against both mosquitoes and flies. Tests of various mineral and vegetable oils as possible substitutes for sesame oil indicated that corn oil and motor oils can be used effectively in the pyrethrum aerosol; addition of the latter also increased the effectiveness of DDT.

Water level relationships of plants in the Tennessee Valley with particular reference to malaria control, T. F. HALL, W. T. PENFOUND, and A. D. HESS (*Jour. Tenn. Acad. Sci.*, 21 (1946), No. 1, pp. 18-59, illus. 10).—Information is presented on seed germination, sprouting, survival, and growth form of littoral plants in relation to water levels; the detailed data are based on 4-yr. observations of 11 reservoirs, 3 natural ponds, and 2 experimental pools in the Tennessee Valley. Three major groups each of herbs and woody plants are recognized in relation to water tolerance, viz, intolerant, moderately so, and tolerant. The findings are applied in a program of malaria control on impounded waters through water level management, four types of water level schedules being used: Combined schedule for main river reservoirs, cyclical fluctuation schedule, water level recession schedule, and constant pool, each of which is fully discussed. There are 34 references.

Studies of the physiology and toxicology of blowflies.—X, A histochemical examination of the distribution of copper in *Lucilia cuprina*. XI, A quantitative investigation of the copper content of *Lucilia cuprina*, D. F. WATERHOUSE (*Austral. Council Sci. and Indust. Res. Bul.* 191 (1945), pp. 39, illus. 7).—Studies of Cu in blowflies were undertaken to follow investigations made of Fe absorption and metabolism and for several reasons, paramount among which were the facts that Cu is of universal occurrence in plants and animals and that its function in the organism is closely linked with and in many instances analogous to that of Fe. Histochemical staining tests with sodium diethyl-dithio-carbamate revealed Cu accumulations in two zones of the acid midgut of full-grown larvae; the malpighian tubules also stained distinctly, but the rest of the body tissues exhibited no indication of the presence of Cu. As the amount of Cu in the larval medium was increased, a greater amount

was accumulated by the midgut; with progressive stages of increase, stages were reached at which growth was appreciably retarded and finally inhibited. As to quantitative determinations, the Cu concentration in the eggs was 5.9 percent of the dry tissue; that in the newly hatched larvae was higher than at any other stage in larval or pupal life. The content fell rapidly during initial growth, reaching the low level of 2.3 mg. percent at 1.5 days and then gradually rising to 3.9 in the pupae. This trend continued until the adult stage, with a final Cu concentration of 6.2 mg. percent. Larval blood contained 0.2 mg. percent Cu. A third to a half of the larval Cu was water-soluble; a similar amount was extracted with 0.5 N HCl. In the eggs, water-soluble Cu formed about a third of the total Cu and a further third was detached by dilute HCl.

DDT for the control of the horn fly in Kansas, E. W. LAAKE. (U. S. D. A.). (*Jour. Econ. Ent.*, 39 (1946), No. 1, pp. 65-68, *illus.* 1).—The objects of these cooperative tests (1945) were to determine the duration of effectiveness of DDT sprays and dips against the horn fly under field conditions and its value to the cattleman for controlling this pest, and to familiarize livestock owners with the proper use of the chemical for treating animals against flies and other external parasites. When all animals in a herd were sprayed, the average duration of effectiveness increased with each treatment, but when only half were sprayed the duration was no greater after the third than after the second spraying. Four dippings of 0.1 percent DDT were effective for as long a time as the four sprayings with 0.2 percent DDT, but dipping required about three times the amount of chemical. The tests gave important information, not only on the effectiveness of DDT against the horn fly but on the amount of damage done by it to the cattle industry; estimates based on one of these tests indicated that the loss of beef due to horn fly injury would amount to 85,980,000 lb., or a value of approximately \$8,598,000. Residual sprays applied to barns for control of houseflies and stableflies showed that nine barns sprayed with a 5 percent DDT emulsion were practically free of these pests for 73 to 98 days.

DDT to control hornflies and Gulf Coast ticks on range cattle in Florida, J. G. MATTHYSSE (*Jour. Econ. Ent.*, 39 (1946), No. 1, pp. 62-65).—Spraying and dipping of 8,402 beef cattle in 36 herds in southern Florida for control of horn flies by DDT indicated the following: The extremes of summer weather—particularly heavy daily downpours—quickly rendered inactive the deposits from low-concentration sprays. Deposits from suspensions resisted inactivation better than those from emulsions. Deposits from sprays of 1 percent or more DDT suspensions remained lethal to horn flies for almost 2 weeks and kept horn fly populations on whole herds at insignificant levels for over a month; deposits from sprays of 1.5 and 2.5 percent DDT suspension remained active little if any longer, and the much higher cost of the 2.5 percent renders it of doubtful value. For long-lasting residual action from emulsions it appears that at least 2.5 percent DDT is required in the spray. Dipping proved more effective at equal concentration than spraying but requires so much more material that it is of doubtful practicability; spraying with 1 percent DDT is far cheaper than dipping in 0.25 percent. A very rapid and effective method of spraying is to arrange many nozzles inside a chute so as to cover the whole body as the cattle run through the spray. The treatment apparently reduced mosquito populations in some cases, but had little effect on tabanids. Inclusion of DDT in adhesive sprays or greases applied to the ears of cattle markedly reduced the incidence of screwworm ear cases predisposed by Gulf Coast tick infestations,

A new method for the control of cattle ticks in tropical regions, R. L. SQUIBB (*Jour. Anim. Sci.*, 5 (1946), No. 1, pp. 71-79, illus. 1).—The new combined solution showed excellent possibilities for use as a spray for controlling and possibly eradicating the cattle fever tick (*Boophilus microplus*). With co-operation of the cattlemen, this method, which appears to kill ticks over a 7-day period, can be more rapid at effecting complete eradication than any of the methods now being employed in the tropics. Tests indicated that a DDT-rotenone combination (detailed formula given) is superior to either used alone, and that increasing the percentage of DDT in the combined solution fails to increase the kill; there were indications that a reduced percentage of DDT in the combined solution was not as efficient. The combined solution worked equally well under dry or wet tropical lowland conditions; in one group of field tests, a continuous rainfall of 8 hr. following application did not interfere with an average kill of 93 percent. Observations over 6 mo. on 1,000 sprayed animals failed to indicate any poisonous or continued irritating effects. An animal covered with 80 to 150 cc. of the solution gave an 85 to 99 percent kill within 7 days after application. A fine penetrating spray proved most efficient; the mortality percentage was definitely related to this spray technic. An apparent progressive killing action was observed to last as long as 7 days; the percentage kill effected was as follows: 24 to 48 hr. after application, 20 to 55; at 48 to 96 hr., 55 to 85; and at 96 to 168 hr., 85 to 99. Infestation of the men working in heavily infested pastures was prevented by spraying 20 cc. of the combined solution over their trousers.

Ticks found in New York State, D. W. BAKER. (Cornell Univ.). (*Cornell Vet.*, 36 (1946), No. 1, pp. 84-90, illus. 18).—An address.

Preliminary tests with DDT for single-treatment eradication of the swine louse *Haematopinus suis*, H. E. KEMPER and I. H. ROBERTS. (U. S. D. A.). (*Jour. Amer. Vet. Med. Assoc.*, 108 (1946), No. 829, pp. 252-254).—Three groups of pigs—all heavily infested with this louse and maintained under average farm conditions—were treated once only with DDT in mineral oil and water emulsions. Sprays containing 0.1 and 0.5 percent DDT—each tested on 1 sow and 7 litter-mate pigs—destroyed all motile lice within 4 hr. but not all young lice hatching thereafter. Only 3 lice, however, were found 8 weeks after treatment with the higher concentration. A dip containing 0.75 percent DDT—tested on 300 heavily infested pigs—not only killed all motile lice within 4 hr. but continued to destroy newly hatched lice thereafter and effectively eradicated this pest from the herd. The nits were not killed by the DDT emulsions used, young lice continuing to hatch but dying after contact with the hairs and skin of treated animals.

A. L. 63, the original British Army louse powder, H. J. CRAUFURD-BENSON and J. MACLEOD (*Jour. Hyg. [London]*, 44 (1946), No. 4, pp. 294-306, illus. 3).—The problem of louse control by powders consists in killing the pests at time of treatment and preventing reinfestation; in the tests reported, no single insecticide fulfilled both functions. The work has shown the necessity of using laboratory tests ("cell tests") in conjunction with insecticide tests on the parasite living under natural conditions; the technic and results from both are described in detail. In the field trials, spontaneously infested persons living in verminous surroundings were treated and observed daily for each preparation. Naphthalene proved the most effective insecticide for quick killing but failed to prevent reinfestation. Derris and pyrethrum were toxic to the body louse, but either alone or in combination proved inferior to certain other materials. The combination of high-boiling-point tar acids with derris resulted in a material more toxic to lice than either alone; this was found

to be an activation effect, and the theory of activation is discussed. Activated derris (referred to as A. L. 63), though slow in killing power, was shown to be the best preparation tried for prevention of reinfestation; the formula for its preparation in percentages is high-boiling-point tar 2, derris root 14.3, naphthalene 50, and China clay 33.7. When applied to the clothing of an infested individual, A. L. 63 killed 95 percent of all lice present within 24 hr. and gave complete protection against reinfestation for an average of 5 days and partial protection for 8 days; applied to clean garments as a prophylactic, it gave complete protection for 7 to 8 days and partial protection for about 16 days. Individuals living in a verminous environment and wearing one shirt continuously for a month without washing were protected from infestation by treating the inside of the garment at 8-day intervals. A brief history of the use of this insecticide in the British Army during 1940-44 is given.

Value of DDT for the control of the northern feather mite *Liponyssus sylvarum*, M. L. POVAR (*Cornell Vet.*, 36 (1946), No. 1, pp. 91-92).—Finely powdered sulfur was not found observably toxic to this mite, but it acted as a repellent. Ten percent DDT powder dusted on birds—though somewhat toxic to the mite—did not prove sufficiently effective to replace treatment with nicotine sulfate.

Observations on the habits and life history of a chigger mite, *Eutrombicula batatas* (Acarina: Trombiculinae), C. D. MICHENER (*Ann. Ent. Soc. Amer.*, 39 (1946), No. 1, pp. 101-118, illus. 34).—The author presents the results of studies of the life history of one of the species of chiggers most commonly encountered in Panama. Such studies of this group are especially important from the standpoint of disease transmission. Since an individual feeds on a vertebrate host only once during its life, the disease organisms must pass from the larva of one generation through all the successive stages—including the egg—to the larva of the next generation.

A note on the culturing of chiggers (Trombiculidae), R. MELVIN (*Ann. Ent. Soc. Amer.*, 39 (1946), No. 1, pp. 143-144).—A satisfactory culture medium for most of the species of chiggers studied consisted of soil and chicken manure from the floor of a chicken house; details of the technic are given.

The composition and origin of a white deposit found in galleries of a wood boring insect in two samples of the wood of *Qualea* sp., W. G. CAMPBELL, D. F. PACKMAN, and D. M. ROLFE (*Empire Forestry Jour.* [London], 24 (1945), No. 2, pp. 232-233, illus. 1).—The white deposit observed was found to be aluminum succinate. There appeared to be little doubt that it arose as the direct result of a flow of the tree sap into the cavities created by a wood-boring insect. These galleries were identified as typical of the workings of larvae of a longhorn beetle (Cerambycidae).

Sulfa drugs to control American foulbrood, L. HASEMAN. (Univ Mo.). (*Jour. Econ. Ent.*, 39 (1946), No. 1, pp. 5-7).—The author's experimental evidence has convinced him that sulfathiazole fed in sugar sirup or in pollen substitute will give an effective control of American foulbrood—used either as a preventive or a clean-up remedy. A thorough clean-up of a colony may protect it against reinfection for two seasons, but feeding the drug each spring and fall is advised, or whenever infection appears as a part of the regular apiary routine. In severe cases, it will pay to relieve colonies of their worst combs, rendering them and replacing with full sheets of foundation or drawn combs. Full directions for use of the method are given.

ANIMAL PRODUCTION

Effect of maturity on the chemical composition and digestibility of the stems and leaves of sweetclover hay, J. SOTOLA. (Wash. Expt. Sta.). (*Jour. Agr. Res. [U. S.]*, 72 (1946), No. 12, pp. 365-371).—In tests carried on in 1939 and 1940, plants of Madrid sweetclover steadily increased in leaf percentage as they matured during the first year, but decreased at an even greater rate in leaf percentage during the second year. The plants decreased in protein, fat, and ash and increased in crude fiber as they matured during the first year. As the second-year growth progressed, the plants decreased sharply in protein and increased in crude fiber, much more so than during the first year. The leaves in both first- and second-year crops showed some decrease in protein, but the decrease was much less than that in the whole plant.

Digestion experiments in which sheep were fed Spanish sweetclover showed the first-year crop, cut for hay when 36 in. high, to contain 6.36 percent digestible crude protein and 52.59 percent total digestible nutrients. The second-year crop, more fibrous and stemmy, contained 11.94 percent digestible crude protein and 44.25 percent total digestible nutrients. Leaf protein, on the average, was 45 percent more digestible than protein of the stems in both the first- and second-year crops.

A study on the vitamin A activity of carotene in green fodder, B. C. R. SARKAR and K. C. SEN (*Jour. Agr. Sci. [England]*, 36 (1946), No. 2, pp. 95-99).—In order to determine the vitamin A value of carotene in different green fodders, an investigation was made of (1) the relation between the chemically determined carotene and its biological activity as compared with that of standard carotene, (2) the purity of the apparent carotene from different sources, (3) the absorption of carotene in rats, and (4) the relative efficiency of the standard carotene and preformed vitamin A. Biological tests indicated the chemical method of assay to be a fair index of the true carotene content of green fodders, and carotene as an extract to be quite as effective in the system as that in plant tissues. β -Carotene is apparently predominant in these materials. Carotene in green fodders as estimated chemically is about 85 to 98 percent pure as shown by chromatographic adsorption through dicalcium phosphate; in other roughages a considerable part is noncarotene in nature. Fecal excretion of true carotene by rats at the 1- to 2- μ g. level of dosage is shown to be 10 to 13 per cent according to the biological method, although the apparent excretion is as high as 40 to 52 percent. When the standard carotene is compared biologically with cod-liver oil vitamin A, the former is found to be only about half as active as an equal weight of the latter. On this basis, the vitamin A value of the various green fodders is only half their true carotene contents.

Studies in the chemistry of grass silage, J. G. ARCHIBALD. (Mass. Expt. Sta.). (*Jour. Agr. Res. [U. S.]*, 72 (1946), No. 8, pp. 277-287).—The author reports upon a biochemical investigation based on 40 samples of the fresh green crops from which the silages sampled were made.

It was found that variations due to the kind of crop used were more significant than those due to the action of the preservative. In general, legume silages had lower pH values and higher total acidity than had the silages made from grasses or small grains. The type of acidity also was different. Legume silages were characterized by a high lactic acid content, while the others showed relatively large amounts of acetic and butyric acids. The most strongly acid-smelling silages were frequently the least acid, as judged

either by pH or total titratable acidity. This is tentatively explained on the ground that butyric acid has an acidic odor much stronger than that of lactic acid, while at the same time the butyric fermentation produces more ammonia, which neutralizes an equivalent quantity of the acid; than is formed in a lactic acid fermentation. The corn silages differed sharply from the grass silages in having lower pH values, very low volatile base content and no butyric acid, and high lactic and acetic acid content.

Of the preservatives used, molasses and ground wheat seemed the only ones at all effective. Salt and lactic acid cultures were in many respects inferior to no preservative at all. Urea was apparently entirely unsuitable for the purpose.

Changes in proximate composition due to the fermentation process showed a definite trend regardless of the nature of the crop ensiled. High carotene values were not always found in silages that were of good quality in other respects. Carotene losses in some of the large silos were excessive.

Small containers utilized in an effort to speed up the work did not prove satisfactory, losses due to rotting and mold being excessive. Conditions existent in a large silo were found not readily duplicated on a small scale. Silage made from wilted alfalfa was quite different in composition from that made from the unwilted crop. The chloride content of some of the silages in which salt was used as a preservative was above the optimum for reasonable intake of salt, and in some samples it was excessive.

Losses in total nitrogen, as indicated by determinations in both the fresh and the dried ground samples, were very variable, being much higher in the silages than in the corresponding green crops. Certain preservatives (molasses and ground wheat) tended to minimize this loss.

The chromatographic procedure for determining carotene gave results consistently somewhat lower than those obtained by the Official (E. S. R., 85, p. 5) phasic separation procedure.

Quarterly report on official feed samples analyzed by the feed and fertilizer department, Kentucky Agricultural Experiment Station (*Kentucky Sta. Regulat. Bul.* 46 (1946), pp. 8).—These analyses cover the quarter ended March 31, 1946.

Blood levels of calcium and inorganic phosphorus in Hereford cattle, M. G. PAYNE, A. G. CLARK, H. E. KINGMAN, and W. M. STANSBURY. (Colo. Expt. Sta. et al.). (*Jour. Agr. Res.* [U. S.], 72 (1946), No. 12, pp. 357-363).—Based on analyses of samples from 560 animals, the normal blood levels of phosphorus and calcium for range Hereford yearling and herd bulls and for range Hereford heifers and aged cows have been determined. The normal levels for blood serum inorganic phosphorus in milligram percent was 7.30 ± 0.103 , 4.76 ± 0.099 , 5.07 ± 0.063 , and 4.89 ± 0.101 for yearling bulls, herd bulls, 2-year-old heifers, and aged cows, respectively. The phosphorus level of blood was found to be greater in bulls than in cows. The quantity of phosphorus diminishes with age in Hereford range cattle, but this relationship with age is stronger in the male animal.

The normal levels for blood calcium in milligram percent were 10.46 ± 0.238 , 13.03 ± 0.256 , 9.13 ± 0.158 , and 9.52 ± 0.249 for yearling bulls, herd bulls, 2-year-old heifers, and aged cows, respectively. A complementary association of phosphorus and calcium has been found as shown by the fact that $r = 0.39 \pm 0.129$ for yearling bulls, -0.03 ± 0.192 for herd bulls, -0.25 ± 0.117 for 2-year-old heifers, and 0.01 ± 0.140 for aged cows. The calcium-phosphorus ratio in homogeneous groups was found to be a variable concept depending on age and sex.

From corn cobs and shucks to beef, J. E. FOSTER (*Res. and Farming [North Carolina Sta.]*, 4 (1946), *Prog. Rpt.* 2, p. 9, *illus.* 1).—This is a brief account of a 114-day feeding test with 23 grade Hereford steers, in which those fed a ration containing corn shelled and coarsely ground gained 2.21 lb. per day per head, as compared with 2.02 lb. for a similar lot receiving coarsely ground whole ears and shucks.

Lamb production and feeding in the El Paso Valley, J. M. and J. H. JONES. (*Tex. Expt. Sta.*). (*Sheep and Goat Raiser*, 26 (1946), No. 8, p. 21).—Feeding tests with 255 head of Rambouillet lambs in 10 lots for 119 days are reported in which heavy feeder lambs reached satisfactory finish by long feeding on alfalfa hay with limited amounts of milo grain. Except for a possible saving in labor, there was nothing to recommend the deferred feeding of grain, even in long feeding. Gains were about as good on lambs fed 43 percent protein cottonseed cake as for an equal amount of milo, but the carcasses of the milo-fed lambs graded higher. First and fourth cutting alfalfa were of equal value. Lambs fed the larger amounts of concentrates returned the heavier carcasses.

The weaning of piglets at an early age, W. A. VERBEEK (*Farming in So. Africa*, 21 (1946), No. 241, pp. 271-275, *illus.* 1).—An experiment comparing the growth of pigs weaned at approximately 3 weeks and 8 weeks indicated that pigs may be successfully weaned at an early age, but it is pointed out that the work is still in its initial stages, especially as to the economic value of the practice.

Effect of diet on efficiency of egg production, H. R. BIRD and D. WHITSON. (U. S. D. A.). (*Poultry Sci.*, 25 (1946), No. 3, pp. 210-214).—In two experiments of 16 weeks' duration, groups of 50 yearling Rhode Island Red hens were fed diets differing in fiber and ash content, and their relative efficiencies of feed utilization were calculated by means of a partition equation. In the first experiment the group fed the diet containing 6.53 percent of ash and 2.56 percent of fiber achieved an efficiency 0.98 times the calculated value, and the group fed the diet containing 9.28 percent of ash and 5.89 percent of fiber was 0.87 times as efficient as calculated. In the second experiment the ratios of observed to calculated efficiencies were 1.13 for the low-ash, low-fiber diet; 1.17 for the high-ash, low-fiber diet; 0.95 for the low-ash, high-fiber diet; and 0.90 for the high-ash, high-fiber diet. It is concluded that a level of 5.89 percent of fiber in a laying mash is sufficient to exert a detrimental effect on efficiency of feed utilization, but not on level of egg production when the fiber is contributed largely by wheat mill feeds, oats, and alfalfa meal.

The utilization of food elements by growing chicks.—XI, A comparison of ground wheat and ground rye in rations for growing chicks, C. W. ACKERSON, W. E. HAM, and F. E. MUSSEHL (*Nebraska Sta. Res. Bul.* 146 (1946), pp. 5).—Continuing this series (E. S. R., 95, p. 378) and using 2 lots of 17 or 18 newly hatched Dark Cornish $\times$ White Leghorn chicks and a 6-week feeding period, either ground wheat and dextrin or ground rye was fed to furnish in each case 25 percent of the protein of the entire mixed ration. The wheat-fed lot made a significantly greater gain than the rye-fed lot. Several cases of curled-toe paralysis occurred in the two lots, and a tendency to cannibalism appeared in the rye-fed lot.

Effectiveness of dietary supplements in increasing hatchability of eggs and viability of progeny of hens fed a diet containing a high level of soybean oil meal, H. R. BIRD, M. RUBIN, D. WHITSON, and S. K. HAYNES. (U. S. D. A.). (*Poultry Sci.*, 25 (1946), No. 3, pp. 285-293, *illus.* 1).—In confirma-

tion of an earlier report (E. S. R., 94, p. 799), it was found that the eggs of hens fed 30 percent of soybean oil meal as the sole protein supplement were low in hatchability. During a period of 43 weeks only 66 percent of the fertile eggs of these hens hatched, compared with 84 percent hatchability of the fertile eggs of hens fed a good breeder mash containing sardine meal as the only protein supplement. The deficiency of the basal diet containing 30 percent soybean oil meal was corrected by the inclusion of 5 percent cow (or steer) manure, 10 percent sardine meal, or 10 percent dried skim milk; the hatchability of fertile eggs produced by hens fed these supplements was, respectively, 82, 78, and 79 percent. The favorable effect of the sardine meal supplement was delayed, being first observed during the third month of the experiment. A similar delay occurred before the full effect of the other two supplements was observed, but a partial response was noted during the first 2 mo. Inclusion of corn gluten feed or extra MnSO_4 in the diet did not improve hatchability, and the response to wheat or butyl fermentation solubles was doubtful.

The deficiency of the basal diet containing 30 percent soybean oil meal was revealed not only by low hatchability but by low viability of chicks hatched. Mortality during the first week of life ranged from 16 to 38 percent in different hatches as compared with 1 to 11 percent for the offspring of the birds fed the positive control diet. The effectiveness of modifications of the hens' diet in improving the viability of chicks paralleled effectiveness in improving hatchability, pointing to the likelihood that low hatchability and low viability are manifestations of the same deficiency. Supplementation of the chicks' diet was not effective in improving viability. The most consistent post-mortem findings in the chicks were kidney damage, urate deposits in the ureters, and distended gall bladders.

The blood vessels and "ground color" of irises of pigment-free Single Comb White Leghorns, R. F. BALL. ([N. Y.] Cornell Expt. Sta.). (*Poultry Sci.*, 25 (1946), No. 3, pp. 242-245, illus. 5).—A detailed description is given of the vascular system and ground color of the pigment-free irises obtained by feeding from hatching to 280 days of age a ration devoid of the yellow carotinoid pigments. In these irises four distinct and regular zones of color were distinguishable.

The significance of the level of riboflavin in the ration of breeding birds, D. R. CLANDININ (*Poultry Sci.*, 25 (1946), No. 3, pp. 223-231, illus. 2).—This study dealt with the effect of the level of riboflavin in the hen's diet on: (1) the riboflavin content of fresh eggs, incubated eggs, and the livers of day-old chicks and (2) the growth, incidence of curled-toe paralysis, and riboflavin content of the livers of chicks fed rations containing varying amounts of riboflavin.

The results confirmed the findings of earlier workers that the level of riboflavin in the ration of breeding birds influences the amount of this vitamin that is present in their eggs, and that the developing embryo does not synthesize riboflavin. It is also concluded that "the level of riboflavin in the ration of breeding birds influences the amount of this vitamin that is present in chicks at hatching time; the amount of riboflavin that is present in chicks at hatching time influences their growth and incidence of curled-toe paralysis when they are fed rations that are adequate or inadequate in riboflavin; the riboflavin content of the livers of chicks (and no doubt the riboflavin content of the chicks themselves) during the first 4 weeks of life is closely correlated with their growth and incidence of curled-toe paralysis; the riboflavin content of the livers of chicks (and no doubt the riboflavin content of the chicks

themselves) during the first 4 weeks of life is closely correlated with the amount of this vitamin that is present in the chicks at hatching time and with the amount of this vitamin that is present in the chicks' diet; the amount of riboflavin present in chicks at hatching time has an important influence on their rate of growth during the first week or two after hatching; and the amount of riboflavin present in the chicks' diet has an important influence on their rate of growth during the third and fourth week after hatching."

The influence of nicotinic acid on the response of chicks receiving a diet high in corn. H. M. SCOTT, E. P. SINGSEN, and L. D. MATTERSON. ([Conn.] Storrs Expt. Sta.). (*Poultry Sci.*, 25 (1946), No. 3, pp. 303-304).—In studies in which a lot of 10-day-old chicks receiving a diet of 76.4 percent of ground yellow corn made a satisfactory growth response during 25 days as compared with a check lot when the ration was supplemented adequately with the available crystalline vitamins of the B-complex, particularly nicotinic acid, there was complete protection from perosis, found in 9 of the 10 chicks in the check lot, and the usual poor feathering ascribed to diets containing large percentages of corn was not observed.

Influence of gelatin and tryptophane on nicotinic acid requirement of chicks. G. M. BRIGGS. (Md. Expt. Sta.). (*Jour. Biol. Chem.*, 161 (1945), No. 2, pp. 749-750).—Day-old chicks were fed a basal diet low in arginine, glycine, and nicotinic acid. When 10 percent gelatin was added (as the source of arginine and glycine), depression in the growth rate and black-tongue occurred. The further addition of nicotinic acid (5 mg./100 gm. diet), or 0.1 or 0.2 percent *dl*-tryptophan, counteracted these effects. The replacement of the gelatin by 0.5 percent *l* (+)-arginine HCl + 3 percent glycine produced fair growth and eliminated the symptoms of black-tongue. Further addition of nicotinic acid or tryptophan to the amino acid mixture merely increased the growth rate slightly.

These studies seem to indicate that the presence of gelatin in the ration greatly increases the nicotinic acid requirement of the chick fed a purified diet.

The activity of synthetic folic acid in purified rations for the chick. T. D. LUCKEY, P. R. MOORE, C. A. ELVEHJEM, and E. B. HART. (Wis. Expt. Sta.). (*Science*, 103 (1946), No. 2684, pp. 682-684, *illus.* 1).—Reduced growth, poor feathering, and low hemoglobin and hematocrit values consistently obtained by feeding a basal ration to chicks were prevented by the addition of 25 γ of synthetic folic acid per 100 gm. of the ration. More than 25 γ were needed when the diet contained sulfasuxidine. Evidence for the possible indirect action of folic acid is summarized.

Vitamin C or whole liver powder gave a slight response in the presence of adequate amounts of synthetic folic acid.

The basal ration consisted of dextrin, 61; casein, 18; gelatin, 10; 1-cystine, 0.3; salts V (E. S. R., 89, p. 580), 6; soybean oil, 5; α -tocopherol, 0.3 mg.; 2-methyl-1,4-naphthaquinone, 0.05 mg.; thiamine, MCL, 0.3 mg.; riboflavin, 0.6 mg.; Ca pantothenate, 2 mg.; choline, Cl, 150 mg.; nicotinic acid, 5 mg.; pyridoxine HCl, 0.4 mg.; biotin, 0.02 mg.; and *i*-inositol, 100 mg. In addition 1,700 U. S. P. units of vitamin A and 170 A. O. A. C. units of vitamin D, were administered by dropper.

Observations on monomethylaminoethanol and dimethylaminoethanol in the diet of chicks. T. H. JUKES, J. J. OLESON, and A. C. DORNBUSH (*Jour. Nutr.*, 30 (1945), No. 3, pp. 219-223).—Monomethylaminoethanol and dimethylaminoethanol were found to prevent perosis in chicks when added to a purified diet which was deficient in choline. Growth was promoted by dime-

thylaminoethanol but not by monomethylaminoethanol. The addition of methionine to the diet did not stimulate growth, but growth was increased when methionine was added to the basal diet plus monomethylaminoethanol or to the basal diet plus dimethylaminoethanol.

Experiments were also made with a basal diet deficient in both methionine and choline. Growth was not stimulated by dimethylaminoethanol unless methionine was also added. Chicks receiving the basal diet did not develop perosis, but perosis developed in chicks receiving the basal diet plus methionine.

See also a note by Jukes and Oleson (E. S. R., 95, p. 94).

A nutritionally produced cerebellar disorder in chicks, not associated with E avitaminosis, F. H. BIRD. (Univ. Calif.). (*Jour. Biol. Chem.*, 161 (1945), No. 2, pp. 747-748).—Chicks were fed a highly purified diet of the following composition per 100 gm.: "Water-washed casein 22.2, *l*(+)-arginine monohydrochloride 0.3, glycine 0.9, *l*(-)-cystine 0.4, calcium gluconate 5.0, cellulose (Cellu flour) 5.0, soybean oil 3.0, fish oil (sardine) (3000 A-400 D) 0.25, sodium chloride mixture containing 0.49 percent manganese, 0.1 percent copper, 0.05 percent zinc, 0.05 percent aluminum, 0.002 percent cobalt, and 0.04 percent iodine 1.0, $\text{Ca}_3(\text{PO}_4)_2$ 3.5, K_2HPO_4 1.3, KCl 0.3, MgSO_4 0.1, $\text{Na}_2\text{SiO}_3 \cdot 9\text{H}_2\text{O}$ 0.25, cholic acid 0.1, choline chloride 0.2, and glucose (cerealose) 56.2 gm. To every 100 gm. of the above mixture were added solubilized liver eluate equivalent to 4 gm. of solubilized liver, thiamine hydrochloride 0.5 mg., pyridoxine hydrochloride 0.4 mg., riboflavin 0.5 mg., *d*-calcium pantothenate 1.5 mg., nicotinic acid 1.0 mg., 2-methyl-1, 4-naphthohydroquinone diacetate 1.0 mg., synthetic α -tocopherol (Merck) 1.0 mg., and biotin 0.01 mg."

On this diet, the chicks developed a disorder characterized by convulsions and lack of coordination. Histological examination of the brain revealed cerebellar lesions. Adequate supplements of vitamin E (synthetic α -tocopherol) did not prevent this disorder.

Calcium, phosphorus, and vitamin D interrelationships in the nutrition of the growing chick, J. S. CARVER, R. J. EVANS, and J. MCGINNIS. (Wash. Expt. Sta.). (*Poultry Sci.*, 25 (1946), No. 3, pp. 294-297).—Growth and bone ash findings with 900 day-old White Leghorn cockerels on 45 different diets indicated an interrelationship between the levels of calcium, phosphorus, and vitamin D in the diet. The results showed that the amounts of calcium and phosphorus, as well as their ratios, are of importance if optimum growth and bone ash are to be obtained.

When no supplementary vitamin D was added to the diets, a progressive improvement in the growth and percentage of bone ash were obtained by increasing the phosphorus content of the diet from 0.5 to 0.8 percent at calcium : phosphorus ratios of 2 : 1 and 3 : 1. At all levels of phosphorus, a 4 : 1 calcium : phosphorus ratio caused a depression in both growth and percentage of bone ash. When vitamin D was added to the diet, a level of 20 A. O. A. C. chick units gave satisfactory growth and bone ash with the 0.8- and 1.0-percent levels of phosphorus at calcium : phosphorus ratios of 2 : 1 and 3 : 1.

Increasing the vitamin D to 60 A. O. A. C. chick units at the above phosphorus levels and calcium : phosphorus ratios did not improve growth or bone ash. On the other hand, at the 1 : 1 calcium : phosphorus ratio and at all levels of phosphorus fed, 60 A. O. A. C. chick units gave better growth and calcification than 20 units. At a 2 : 1 ratio and 0.5 and 0.6 percent phosphorus levels, 60 units gave better growth and calcification than 20 units. Neither the 20- nor the 60-unit level of vitamin D improved growth at the

4 : 1 ratio of calcium to phosphorus over the corresponding groups fed no vitamin D.

Phosphorus in poultry nutrition.—II, Sodium acid phosphate, tri-calcium phosphate, and bonemeal as sources of phosphorus for the growing chick, E. P. SINGSEN and H. M. SCOTT. ([Conn.] Storrs Expt. Sta.) (*Poultry Sci.*, 25 (1946), No. 3, pp. 302-303).—Continuing this series (E. S. R., 94, p. 368), feeding experiments with 3 lots of 25 chicks each are reported. Growth and bone ash data revealed that the phosphorus of all three supplements was readily and equally available for bone calcification, that growth was very similar on all three phosphorus supplements, and that 0.45 percent available phosphorus in the diet will support excellent growth and bone calcification in the chick. "The results support the conclusion that the phosphorus of bonemeal and tricalcium phosphate is as available to the chick as that of sodium acid phosphate, and that experimental data obtained using the latter may be applied with safety to practical poultry diets in which bonemeal and bone-containing products constitute the principal sources of phosphorus."

Sources of calcium for laying chickens during hot weather, B. W. HEY-WANG. (U. S. D. A.). (*Poultry Sci.*, 25 (1946), No. 3, pp. 215-222).—During two experiments, calcium gluconate, technical-grade calcium lactate, calcium *d*-lactate, precipitated calcium carbonate, and calcium sulfate were compared with the calcium carbonate of high-grade limestone as sources of egg-shell calcium for White Leghorn hens. The ratio of dried-shell weight to whole-egg weight was used as the measure of the relative value of these sources of calcium. Data from the first experiment were grouped into periods when the average maximum air temperature was 67°, 74°, 90°, and 102°F., and those from the second experiment into periods when it was 67°, 74°, 81°, 93°, and 102°. None of the other calcium sources was superior, and calcium sulfate was slightly inferior, to the calcium carbonate of high-grade limestone as a source of eggshell calcium during periods of either relatively high or moderate air temperatures. The different sources of calcium were also similar in their effect on whole-egg weight.

Calcite grit and granite grit as supplements to a chick starting ration, G. F. HEUSER and L. C. NORRIS. (Cornell Univ.). (*Poultry Sci.*, 25 (1946), No. 3, pp. 195-198).—The feeding of a granite grit in addition to a complete starting mash did not materially affect the 8-week weights of cockerels reared in batteries, but there was some evidence that feed efficiency was very slightly increased and heavier and larger gizzards were developed.

The free-choice feeding of a calcium grit showed a slight tendency toward decreased weight. The addition of 5 percent to the starting mash significantly decreased growth and increased mortality.

Observations on unabsorbed yolk in chicks, H. E. LEMASURIER, H. D. BRANION, and F. N. MARCELLUS (*Poultry Sci.*, 25 (1946), No. 3, pp. 300-302).—Barred Plymouth Rock chicks hatched under hens or in incubators and reared with the hen outdoors or with battery brooders or brooder stoves indoors were killed at half-weekly intervals to determine the amount of yolk material remaining in the body cavity. None of the chicks hatched under hens showed any yolk material after 7 days, but unabsorbed yolk was found in many chicks hatched in incubators in all ages up to the end of the 6 weeks' duration of the experiment. In another lot of 200 chicks hatched in an incubator and reared in battery brooders, almost all chicks examined up to 5 weeks of age showed unabsorbed yolk material, and in some cases masses up to ½ in. in length were present after this age. The authors "are inclined to believe that all yolk material remaining in the body cavity of the chick after

1 week from hatching must be regarded as a foreign body, rather than a source of nutrient. It would seem, nevertheless, that presence of this material has little or no influence on growth or livability."

The vitamin D requirements of ducklings, I. MOTZOK, W. D. GRAHAM, H. D. BRANION, and S. J. SLINGER (*Poultry Sci.*, 25 (1946), No. 3, pp. 298-299).—The assays reported indicated a vitamin D requirement for White Pekin ducklings in excess of 30 units per 100 gm. of ration.

The requirement of the turkey poult for vitamin B₆, L. R. RICHARDSON, A. G. HOGAN, and H. L. KEMPSTER. (Mo. Expt. Sta.). (*Jour. Nutr.*, 30 (1945), No. 3, pp. 151-157, illus. 1).—Turkey poults developed a spastic type of cervical paralysis on rations severely deficient in vitamin B₆ but which contained reasonable amounts of all other required vitamins. The poults which were examined had a lower red cell volume than is normal, but none were markedly anemic. Remission of the symptoms was obtained by the administration of crystalline vitamin B₆.

Squab raising, A. R. LEE and S. K. HAYNES (*U. S. Dept. Agr., Farmers' Bul.* 684, rev. (1946), pp. 25+, illus. 19).—This is an enlarged and revised edition (*E. S. R.*, 33, p. 872).

DAIRY FARMING—DAIRYING

Scientific advances in the dairy industry: A review of much literature of the year 1945, J. H. SHRADER (*Jour. Milk Technol.*, 9 (1946), No. 2, pp. 67-100).—Results from an estimated coverage of at least four-fifths of the available literature are reviewed, including about 400 titles.

Reviews of the progress of dairy science: Section A, Physiology of dairy cattle.—I, Reproduction and lactation, J. A. B. SMITH (*Jour. Dairy Res.* [London], 14 (1945), No. 1-2, pp. 195-224).—This review cites 358 references, mainly to the literature from 1940 to 1943.

Variation between breeds in feed cost of milk production, L. COPELAND. (Ky. Expt. Sta.). (*Jour. Dairy Sci.*, 29 (1946), No. 6, pp. 345-348).—Tables are presented showing comparative cost-of-production data for Jerseys and Holsteins in the station herds, two-breed associations in the Louisville area, and all herds finishing a year's testing by the dairy extension department. In all these tables it was observed that Jerseys consistently showed the lowest feed cost per pound of butterfat, while Holsteins produced 100 lb. of milk with the lowest feed cost. However, on a basis of energy value as expressed in 4 percent fat-corrected milk, there was little difference between the respective breeds in feed cost. "Purebred herds apparently produced 4 percent F. C. M. at a lower feed cost than did grade herds."

Carotene utilization in the newborn calf, A. A. SPIELMAN, J. K. LOOSLI, J. W. THOMAS, C. L. NORTON, and K. L. TURK. (Cornell Univ.). (*Jour. Dairy Sci.*, 29 (1946), No. 6, pp. 381-391, illus. 2).—Experiments were conducted with 18 newborn dairy calves to study carotene utilization. Holstein, Guernsey, and Jersey male calves were fed a skim milk-low carotene ration from birth without having received colostrum. Crystalline carotene in peanut oil or lard, alfalfa leaf meal, and a commercial carotene concentrate were used as sources of carotene. Blood plasma levels and liver storage of carotene and vitamin A, growth, and general well-being were used as criteria of carotene utilization.

The onset of infection and scours shortly after birth reduced the absorption and utilization of carotene regardless of the amounts fed. The alfalfa leaf meal and the preparations of crystalline carotene in peanut oil or lard were

unsatisfactory carotene sources. Satisfactory prevention and control of scours was obtained in most cases by oral administration of 4 to 8 gm. of sulfathalidine daily for the first week. When scours were controlled, the calves were able to utilize the carotene in a commercial concentrate at a rate sufficient to provide for satisfactory growth and some storage in vitamin A in the liver.

Low solids-not-fat content of milk in South Africa. S. W. J. VAN RENSBURG (*Farming in So. Africa*, 21 (1946), No. 241, pp. 217-228, illus. 6).—The mastitis investigations carried out at Onderstepoort during the past 7 yr. included a study of the various factors which may produce an alteration in the composition of milk. This involved regular bacteriological, physical, and biochemical examinations of milk from the individual quarters of the udders of a herd of grade Friesland cows which were kept free from mastitis over a period of 5 yr. The factors which were shown by these investigations to have a depressing effect on milk solids are (1) bovine mastitis, (2) seasonal and nutritional conditions, (3) stage of lactation, (4) advancing age, (5) general management of dairy cows, (6) individuality, and (7) conformation and structure of the udder.

A readily prepared medium for the cultivation of the lactobacilli. C. B. McLAUGHLIN (*Jour. Bact.*, 51 (1946), No. 4, pp. 560-561).

Influence of yeast extract on *Lactobacillus bulgaricus* incubated at various temperatures. R. J. SWABY (*Jour. Austral. Inst. Agr. Sci.*, 11 (1945), No. 4, pp. 191-192).—In fermentations conducted at 30° and 49° C. it was apparent that yeast extract encouraged greater cell growth and lactic acid production.

Effect of unsaturated fatty acids on the acid production of *Lactobacillus helveticus*. E. KODICEK and A. N. WORDEN (*Nature [London]*, 157 (1946), No. 3993, p. 587).—The experimental results described with α - and β -elaeostearic, oleic, and elaidic acids are said to be in keeping with the physico-chemical hypothesis of the inhibitory effect on growth and acid production, although they do not necessarily exclude a purely chemical interaction.

The formation of carbon dioxide by lactic acid bacteria and *Bacillus licheniformis* and a cultural method of detecting the process. T. GIBSON and Y. ABDEL-MALEK (*Jour. Dairy Res. [London]*, 14, (1945), No. 1-2, pp. 35-44).—The amount of CO₂ produced during fermentation of sugars by the heterofermentative lactic acid bacteria depends on several factors: (1) The sugar fermented: Gas is produced more readily from glucose than from lactose. (2) The reaction and buffering capacity of the medium: The optimum initial reaction is about pH 7, and the greater the buffering capacity the more active is the gas production. (3) Factors occurring in plant juices and yeast: These may promote gas formation without increasing cell proliferation and apparently have a specific effect on the fermentation mechanism. (4) The concentration of sugar: The optimum is about 5 per cent. CO₂ production by *B. licheniformis* is influenced similarly, but in this case the optimum initial reaction of the medium is around pH 8 to 9 and the factors of (3) have little effect.

A description is given of a simple culture test in which these organisms produce visible gas, thus differentiating them from other lactic acid bacteria or from spore formers. The media consist of 5 percent glucose in nutrient gelatin or a mixture of four parts milk and one of nutrient agar, with added yeast extract and a plant juice where necessary. The ability to produce visible gas in a citrate nutrient gelatin medium sealed with agar differentiates certain enterococci and lactobacilli from other species of lactic acid bacteria. In the citrate medium supplemented with comparatively low concentrations

of glucose the heterofermentative lactic acid bacteria produce visible gas, but certain strains fail to do so consistently. No evidence was obtained that growing cultures of lactic acid bacteria liberate H. There are 19 references.

The effect of acidity on the production of diacetyl by betacocci in milk, G. A. COX (*Jour. Dairy Res.* [London], 14 (1945), No. 1-2, pp. 28-35, illus. 4).—Betacocci isolated from starters, cheese, and ryegrass investigated at pH 5.5 to 4.4 produced diacetyl and later partially or wholly destroyed it. The amount of diacetyl produced by different strains varied considerably, but the capacity to produce it could not be correlated with any properties of the bacteria. The rate of growth was progressively slower the lower the pH, but at least as much diacetyl was eventually formed at low as at high values. The results revealed an alternation in the metabolism of the organisms, the diacetyl-producing power per unit cell increasing with lowering of the pH. The findings enable an explanation of the rapid production of diacetyl in mixed starters of betacocci (*Streptococcus citrovorus* and *S. paracitrovorus*).

Temperature control in the H. T. S. T. pasteurization process, J. A. HALL (*Jour. Dairy Res.* [London], 14 (1945), No. 1-2, pp. 1-20, illus. 18).—An investigation has been made into the accuracy and speed of response of temperature-measuring instruments suitable for use in the control of high-temperature short-time pasteurization. Thermocouples used in conjunction with a "D. C. amplifier" recorder system are shown to be markedly superior to both vapor-pressure and mercury-in-steel thermometers. The accuracy of temperature measurement is about $\pm 0.3^{\circ}\text{F.}$ as against $\pm 1^{\circ}$, while the lag constant is about 0.2 sec. as against about 3 sec. Response to small, rapid, and transient changes of temperature is also shown to be greatly improved. The operation of control contacts by the thermocouple recorder was found to be reliable to well within the limits of accuracy of calibration, but the other types showed variations of the order of $\pm 1^{\circ}$ in addition to the uncertainties of calibration.

The resazurin and methylene-blue tests as a measure of the keeping quality of milk, E. B. ANDERSON and G. S. WILSON (*Jour. Dairy Res.* [London], 14 (1945), No. 1-2, pp. 21-27).—Raw milks were examined during four periods equally spaced throughout the year by the resazurin test and two modifications, the modified methylene-blue test, and a keeping quality test based on taste and alcohol precipitation. From results with 2,588 samples, it is concluded that the data recorded "all go to show that the best indirect index of the K[eeing] Q[uality] of raw milk is afforded by the methylene-blue test as carried out by the method officially laid down by the Ministry of Health. On the other hand, if time is an overruling consideration, then a slightly less accurate estimate of the K. Q. of raw milk is afforded by the 1-hr. resazurin test."

The effect of feeding cod-liver oil on the "oxidized" and "goaty" flavors and vitamin C in milk, E. S. GUTHRIE. (Cornell Univ.). (*Jour. Dairy Sci.*, 29 (1946), No. 6, pp. 349-358, illus. 8).—Feeding cod-liver oil to four cows whose milk was previously free from off-flavors resulted in a loss in the fresh milk of the characteristic flavors of new milk. The milks became oily, but did not have the distinctive cod-liver oil flavor. On standing, a goaty flavor appeared in the milks of three of the cows, and an oxidized flavor in two. In a second experiment with six cows, the milks of two did not acquire an oxidized flavor (with only slight exceptions). The milks of the remainder became oxidized, apparently as the result of administering cod-liver oil either in the feed or by drenching. During a period of 41 days of drenching, the first milk from cow 1 showed a slightly oily flavor, not typically fishy, but later, a very

strong oxidized flavor developed which was of the fishy order. The goaty flavor appeared in this experiment only once and lasted from November 25 to December 4 in the milk of one cow. The vitamin C was below average when the milk was goaty in this experiment, whereas during the first year this flavor was noticeable when the vitamin C was present in abundance.

The results of deaeration on the oxygen, vitamin C, and the oxidized flavors of milk, E. S. GUTHRIE. (Cornell Univ.). (*Jour. Dairy Sci.*, **29** (1946), No. 6, pp. 359-369).—An intermittent deaerator was used in a series of experiments that extended through 3 periods in 3 yr., or a total of 57 weeks. The vitamin C in the milk in these series of analyses dropped from 17.9 mg. per liter in the fresh milk to 16.42 mg. per liter in the deaerated milk at the end of 7 days, and to 7.68 mg. per liter in the undeaerated milk during the same period. The flavor of the milk that was deaerated in the unit was "excellent" when fresh. At the end of 7 days the deaerated milk was "good," whereas the undeaerated milk was "poor" due to the oxidized flavors.

Data obtained during the first 30 months' operation by largely unskilled operators of a continuous deaerator are also reported. Out of 362 analyses on as many days, 49 samples contained no oxygen and many others were near that point. The average of 250 analyses of fresh milk was 17.19 mg. of vitamin C per liter. The "in-bottom filled," the "commercially filled," and the "air reincorporated" samples of 7-day-old milk averaged 15.26, 13.03, and 6.08 mg. of vitamin C per liter, respectively. The flavor of the fresh milk, in general, was excellent, and at the age of 7 days the in-bottom filled, the commercially filled, and the air reincorporated milks were good, fair, and poor, respectively.

"The deaerators used in this study were constructed to take the oxygen out of milk in order to prevent the development of the oxidized flavors. The opinions of several reputable judges of milk show that they accomplished the purpose for which they were made. An added advantage of importance is the preservation of substantial amounts of vitamin C."

Nutritional studies on milk fat, I, II. (Univ. Calif.). (*Jour. Nutr.*, **30** (1945), No. 3, pp. 169-181, illus. 3).—Two papers are presented.

I. *The growth of young rats fed milk and certain synthetic glycerides as supplements to a fat-free diet*, J. L. Henderson, E. L. Jack, S. Lepkovsky, and D. F. Reid (pp. 169-173).—A fat-free diet is described in which all the components were pure compounds with the exception of casein extracted with alcohol and ether. This diet gave satisfactory growth when fed to young rats. Supplementing diets contained fat 20 percent, casein 30, glucose 46, and salt mixture 4 percent, and the same vitamin supplements as the fat-free diet. The fats used were trilaurin, triolein, trilaurin and triolein 1 : 1, and milk fat.

The rats on the milk fat diet and on the triolein diet grew faster than those on the other diets. No significant difference between the two diets with respect to growth was noted. Trilaurin, when fed at the level of 20 percent, enabled the rats to grow at about the same rate or slightly slower than the rats on a fat-free diet. When 10 percent each of trilaurin and triolein were fed, the growth of the rats was intermediate between those receiving trilaurin and those receiving triolein.

II. *The growth of young rats fed glyceride fractions separated from milk fat*, E. L. Jack, J. L. Henderson, D. F. Reid, and S. Lepkovsky (pp. 175-181).—Five glyceride fractions separated from milk fat by precipitation from a solvent were fed to weanling rats. The gains in weight placed the

fractions in three groups. The -53° filtrate was superior to all other diets containing solvent-treated fat; the -7° precipitate and the fat-free were the poorest; the others formed an intermediate group. The diet containing natural milk fat which had not been solvent-treated gave greater growth than any other diet. Diets containing the solvent-treated milk fats (natural, synthetic, and composite) fell in the intermediate group with no significant difference between them. The fatty acid composition of the fats suggested that either the oleic acid content or the total unsaturation might be a factor contributing to differences in growth.

Experiments on the packing and storage of butter.—V, The effect of temperature-level of storage on the keeping quality, C. R. BARNICOAT (*New Zeal. Jour. Sci. and Technol.*, 27 (1945), No. 4, Sect. A, pp. 343-348, illus. 2).—Continuing this series (E. S. R., 80, p. 678), the use was studied of temperatures higher and lower than the 14° F. used for overseas transport of the meat with which it is usually shipped. At temperatures between 14° and 60° , the average rate of deterioration of well-made "sweet cream" butter, as measured by decrease in grade score for flavor, was directly related to both time and temperature. The average rate of loss in grade score increased by approximately 0.15 points per week for each 10° rise in temperature above 14° . Some advantage was obtained by storing butter at -5° instead of 14° , but it was so slight that it "would hardly seem to warrant the extra expense involved."

Some experiments on the use of parchfoil and Pliofilm for the wrapping of butter in Pinus radiata boxes, F. H. MCDOWALL (*New Zeal. Jour. Sci. and Technol.*, 27 (1945), No. 4, Sect. A, pp. 303-308).—Attempts in New Zealand to utilize the Monterey pine (*P. radiata*) for boxes for export butter revealed a strong timber taint within 10 days in butter wrapped in parchment paper and packed in boxes made from this wood. Use of an aluminum foil sandwiched between parchment sheets prevented development of both primrose color on the surface and of timber taint in the butter, over a period of up to 2 yr., except at joints in the foil wrapping. Sealing of butter in an envelope made from Pliofilm, quality N1V140 or NOV140, prevented development of primrose color over a storage period of 2 yr., but timber taint appeared on the surface after 6 months' storage and was very strong after 2 yr. Treatment of the *P. radiata* shooks with Pliowax before assembly of the box did not prevent timber taint when parchment wrappers were used, but limited it to negligible proportions when a Pliofilm wrap was used with the treated box. Tensilized Pliofilm was not satisfactory with the untreated box with or without parchment.

A study of the balance of certain milk nutrients in the making of Cheddar, Cheshire, and Stilton cheeses, and of their fate during the ripening of the cheeses, D. V. DEARDEN, K. M. HENRY, J. HOUSTON, S. K. KON, and S. Y. THOMPSON (*Jour. Dairy Res.* [London], 14 (1945), No. 1-2, pp. 100-116, illus. 3).—A study is reported of the recovery in Cheshire, Cheddar, and Stilton cheese of what are termed the "minor" constituents of summer and winter milk, especially the content of the vitamins and certain minerals. Some 80 percent of vitamin A and carotene, 15 percent of vitamin B₁, and 25 percent of riboflavin originally present in milk were recovered in the green cheese and persisted throughout ripening. Vitamin C disappeared progressively during cheese making and was absent from the cheeses. Vitamin B₁ and especially riboflavin were recovered in cheese in larger proportions than would be expected from the partition of water between curd and whey,

indicating that they were partly present in milk in combination with the coagulable solids.

The concentrations of the various vitamins in milk and in the ripe cheeses were, respectively, for the winter experiment: Vitamin A 15 International Units per gram of fat and 13 I. U./gm. fat; carotenoids, 1.8 $\mu\text{g./gm. fat}$ and 2.0 $\mu\text{g./gm. fat}$; vitamin B₁ 33.5 $\mu\text{g./100 gm.}$ and 53 (Cheddar), 44 (Cheshire), and 80 (Stilton) $\mu\text{g./100 gm.}$; riboflavin 84 $\mu\text{g./100 gm.}$ and 300 (Cheddar), 260 (Cheshire), and 240 (Stilton) $\mu\text{g./100 gm.}$ For the summer experiment the values were: Vitamin A 28 I. U./gm. fat and 25 I. U./gm. fat; carotenoids 10 $\mu\text{g./gm. fat}$ and 9-10 $\mu\text{g./gm. fat}$; vitamin B₁ 42 $\mu\text{g./100 gm.}$ and 55 (Cheddar), 48 (Cheshire), and 75 (Stilton) $\mu\text{g./100 gm.}$; riboflavin 128 $\mu\text{g./100 gm.}$ and 330 (Cheddar), 330 (Cheshire), and 360 (Stilton) $\mu\text{g./100 gm.}$

There was no difference between the three types of cheese made in winter in biological value or true digestibility of the proteins, for which values of 72 and 98, respectively, were obtained at an 8-percent level of protein intake.

Diets were blended from dried Cheshire, Cheddar, or Stilton cheese and from dried whey to approximate the composition of a sample of dried milk. These diets, when supplemented with iron, copper, and manganese and given as an exclusive diet, produced growth in rats as good as that obtained with the mineralized milk itself.

[Bacteriophage studies with cheese] (*Jour. Dairy Res.* [London], 14 (1945), No. 1-2, pp. 64-100, illus. 5).—These studies include Bacteriophage Infection in Cheese Manufacture, by H. R. Whitehead and G. J. E. Hunter (pp. 64-80); and Observations on Cheese Starters With Reference to Bacteriophage and the Phage-Organism Relationships of Strains Isolated (pp. 91-93), and The Heat Resistance of the Bacteriophages of Cheese Starter, With Observations on the Estimation of Phage Concentration (pp. 93-100), both by A. A. Nichols and J. Z. Wolf.

Reactions and properties of annatto as a cheese colour, II, C. R. BARNICOAT (*Jour. Dairy Res.* [London], 14 (1945), No. 1-2, pp. 59-63).—Further work on the standardization of annatto for cheese coloring supports the author's earlier conclusions (E. S. R., 77, p. 390) that the coloring power of annatto extracts in cheese can be estimated by their tinctorial power in dilute alkaline solution. A simple tintometer of the "Limitester" type was found to be suitable for this work, a standard orange disk, or Lovibond yellow and orange glasses, being used as the standard.

[Research on dried milk] (*Jour. Dairy Res.* [London], 14 (1945), No. 1-2, pp. 116-194, illus. 13).—The following papers are included: The Effect of Temperature of Pre-heating, of Clarification, and of Bacteriological Quality of the Raw Milk on the Keeping Properties of Whole-Milk Powder Dried by the Kestner Spray Process, by A. T. R. Mattick, E. R. Hiscox, E. L. Crossley, C. H. Lea, J. D. Findlay, J. A. B. Smith, S. Y. Thompson, and S. K. Kon (pp. 116-159); Spray-Dried Milk Powder—Commercial Observations Over Two Years of the Effect of High-Temperature Pre-heating, by E. L. Crossley (pp. 160-164); Experiments on the Use of Antioxidants in Spray-Dried Whole-Milk Powder, by J. D. Findlay, J. A. B. Smith, and C. H. Lea (pp. 165-175); The Effect of the Method of Reconstitution and of the Temperature of Incubation on the Plate Count of Spray-Dried Milk Powder, by E. R. Hiscox (pp. 175-183); and The Technique of the Bacteriological Examination of Dried Milks, by C. Higginbottom (pp. 184-194).

Condensed milk and milk powder, O. F. HUNZIKER: (*La Grange, Ill.: Author, 1946, 6. ed., rewritten, pp. 502 +, illus. 128*).—This edition (E. S. R., 73, p. 676) has been condensed and rewritten.

Relation of the temperature of separation and the heat treatment given the skim milk to the keeping quality of spray-dried ice cream mix, H. PYENSON and P. H. TRACY. (Univ. Ill.). (*Jour. Dairy Sci., 29 (1946), No. 6, pp. 371-379*).—There was a tendency toward more rapid oxygen absorption, more carbon dioxide evolved, and more oxidized flavor development in mixes that had the condensed skim milk forewarmed to 150° F. for 20 min. than in those mixes that had the condensed skim milk forewarmed at 180° for 5 min. There seemed to be no significant differences in oxidized flavor development when the mixes were prepared from concentrated skim milk made from skim milk separated at 55° or 130°. Whether the fat used was in the form of cream, butter, or butter oil was not a factor influencing the keeping quality of the dried ice cream mix. All the batches which contained butter oil, butter, or cream became oxidized if made with skim milk forewarmed at 150° for 20 min. After 1 yr., dried mixes made from skim milk forewarmed at 180° for 5 min. had not developed an oxidized flavor and were still highly palatable.

"High forewarming temperature on the skim milk before condensing is beneficial in prolonging the keeping qualities of dried ice cream mixes and the retardation of oxidized flavor development."

Technical literature [on ice cream] for 1945, A. LEIGHTON. (U. S. D. A.). (*Ice Cream Rev., 29 (1946), No. 11, pp. 41-42, 106-112*).—This is a review of the technical literature on ice cream for 1945, with a bibliography of 216 titles.

VETERINARY MEDICINE

[Miscellaneous papers] (*Cornell Vet., 36 (1946), No. 1, pp. 1-16, 51-66, illus. 10*).—These papers include Observations on Prolapsed Rectum in Sheep, by J. W. Britton (pp. 1-4) (Univ. Calif.); Urinary Calculi Associated With Vitamin A. Deficiency in the Fox, by C. F. Bassett, L. E. Harris, S. E. Smith, and E. D. Yeoman (pp. 5-16) (Cornell Univ. et al.); and The Lymphatic Circulation of the Hind Limbs of the Horse, by I. Rossoff (pp. 51-66).

Tolerance of farm animals to feed containing 2,4-dichlorophenoxyacetic acid, J. W. MITCHELL, R. E. HODGSON, and C. F. GAETJENS. (U. S. D. A.). (*Jour. Anim. Sci., 5 (1946), No. 2, pp. 226-232, illus. 1*).—Sheep and cows grazed pasturage treated with a liberal application of weed killer (2,4-dichlorophenoxyacetic acid and Carbowax mixture). There was no apparent reduction in its palatability. The 2,4-D, consumed either on pasture grass eaten by sheep and cows or in the ration fed to a cow at the rate of 5.5 gm. daily, produced no apparent harmful effects in the health and performance of the animals. Post-mortem examinations revealed no pathological conditions in cows grazing on pasture treated with 2,4-D, nor was this material found to be present in the liver, kidney, or fatty tissues of a cow fed 2,4-D.

By means of a biological method of assay, the presence of 2,4-D was demonstrated in the blood serum of a cow fed 5.5 gm. of this material daily for 106 days. Results of these tests indicate that the 2,4-D probably occurred as a water-soluble salt. The 2,4-D was not found to be secreted into the milk, nor was it found in the blood serum of a calf fed milk from the cow that received it in her ration.

It is concluded from these data that the amount of 2,4-D that might be consumed by cows or sheep from pasturage sprayed with this material to

kill weeds would not be injurious. It is pointed out, however, that these experiments are based on the use of purified 2,4-D together with Carbowax, and that while they indicate that the acid is not toxic the results are not applicable to proprietary formulations that might contain other ingredients.

Pathology of selenium poisoning, I. ROSENFELD and O. A. BEATH (*Wyoming Sta. Bul. 275 (1946), pp. 27, illus. 19*).—The material for this report was obtained from 10 range animals showing acute selenium poisoning, 5 range animals showing "alkali disease," and 10 showing the "blind staggers" type of chronic selenosis. Also included is a study of the gross and microscopic pathologic changes of the subacute and blind staggers type of chronic selenium poisoning produced experimentally. Yearling ewes were used as experimental animals, and the selenium was administered by drenching.

Gross and microscopic pathologic findings of acute, subacute, and chronic selenium poisoning are presented. It is stated that each different type of selenium poisoning presented a well-defined pathologic entity. Diagnosis can be made on the basis of the pathologic findings in the liver, lung, kidney, gastrointestinal tract, and spleen. It is erroneous to base the diagnosis on the changes observed in a single organ since selenium enters in the blood very rapidly and produces injury in all the organs. The action of selenium appears to be similar to that of arsenic. The primary injury appeared to be cellular due to the capillary damage.

In acute selenium poisoning, the outstanding pathologic changes were necrosis and hemorrhages due to capillary damage. In subacute poisoning, various degrees of repair and early fibrosis were observed in all the organs. Chronic selenosis was subdivided into two groups—blind staggers and alkali disease. In blind staggers on a low grade, chronic injury, an acute exacerbation was superimposed. The tissues showed chronic degenerative changes with acute toxic reaction. In alkali disease, chronic, toxic degenerative changes were observed in all organs, and acute irritation was absent.

The relations of the pathologic changes to the functional disorders are discussed.

The elimination and distribution of selenium in the tissues in experimental selenium poisoning, I. ROSENFELD and O. A. BEATH. (*Wyo. Expt. Sta.*). (*Jour. Nutr.*, 30 (1945), No. 6, pp. 443-449).—Sheep were fed graded doses of selenium for a limited period (44 days) or until death. Analyses of urinary excretion of selenium showed that prior to death from selenium poisoning, the animals eliminated smaller quantities in the urine, due to kidney damage, and stored larger amounts in all tissues.

Those animals fed selenium for a limited period continued to excrete selenium gradually in the urine for a considerable time after the mineral was no longer incorporated in the diet. Not until 50 days later did the urine show only traces or was free of selenium.

The storage of selenium in the body varied with the amount administered. The liver and kidney, in all groups tested, contained the greatest amount, while the brain and muscle contained the least. No selenium was found in the fat.

Small amounts of selenium were present in all tissues 61 and 64 days after the last dose had been given. The authors consider the amount present at this time to be insufficient to cause any harmful effects if used in the human diet.

The relationship between diet and the mechanisms for defense against bacterial infections in rats, L. J. BERRY, J. DAVIS, and T. D. SPIES (*Jour. Lab. and Clin. Med.*, 30 (1945), No. 8, pp. 684-694, illus. 2).—"These observa-

tions support the working hypothesis that resistance to certain bacterial infections may be depressed by inadequate nutrition and are in agreement with work previously done with patients. Malnutrition is thus shown to be a factor in susceptibility to infection, but this is not necessarily true in every type of infection."

Changes of the blood constituents in diseases of ruminants, J. W. BRITTON. (Univ. Calif.). (*Cornell Vet.*, 36 (1946), No. 1, pp. 25-30).—Normal values for hemoglobin cell volume, sugar, and nonprotein nitrogen of the blood of 134 sheep under varying conditions of management were ascertained. The biochemical changes accompanying various digestive disorders in sheep and cattle are also enumerated.

Dissociation in *Brucella abortus*: A demonstration of the rôle of inherent and environmental factors in bacterial variation, W. BRAUN. (Univ. Calif. coop. U. S. D. A.). (*Jour. Bact.*, 51 (1946), No. 3, pp. 327-349, illus. 9).—With the help of single cell isolation the existence of inherent differences between clones of *B. abortus*, strain 19, in regard to dissociation percentages has been demonstrated under standardized environmental conditions. Clones with statistically significant differences in dissociation indices have been systematically selected and have remained stable if stored at low temperatures. These inherent dissociation percentages can be modified by environmental changes, particularly changes which affect growth rates and viability.

The studies on environmental effects suggested that dissociation percentages, as such, are not an inherent characteristic, but rather secondary indicators of primary inherent differences in growth rate and viability between clones. Bacterial dissociation is thus interpreted in terms of the spontaneous appearance of variants (mutants) and their subsequent establishment under the control of the inherent and environmental factors which govern population dynamics.

What do we know about ketosis (acetonemia) in dairy cattle? J. C. SHAW. (Univ. Md.). (*Holstein-Friesian World*, 43 (1946), No. 9, pp. 24-25, 113, illus. 3).—An experimental ketosis was produced by reducing the food intake just prior to calving and subsequent thereto and alleviated by an increase in feed consumption, but it is stated that "other cases have been observed where it was difficult to ascribe the ailment to a limited feed intake." No case of ketosis was found in rather extensive experiments in which either the blood plasma carotene or vitamin A was low, and massive doses of vitamin A and thiamine and other B vitamins and intravenous and oral administration of methionine have not been found beneficial. The best treatment found to date is the injection of dextrose directly into the venous blood, supplemented by the feeding of some form of soluble sugar such as molasses or corn sugar. Severe cases may require several injections.

Other findings are presented graphically and discussed.

What do we know about ketosis in dairy cattle? J. C. SHAW. (Univ. Md.). (*Guernsey Breeders' Jour.*, 69 (1946), No. 10, pp. 1316-1319, 1362, 1364, illus. 3).—A practical discussion of this disease, including its occurrence, diagnosis, treatment, and prevention.

The value of vitamin A therapy in cases diagnosed as ketosis in dairy cows, C. E. HAYDEN, M. G. FINCHER, S. J. ROBERTS, W. J. GIBBONS, and A. G. DANKS. (Cornell Univ.). (*Cornell Vet.*, 36 (1946), No. 1, pp. 71-84).—This study of 10 cases which seemed to represent some degree of ketosis revealed unsatisfactory responses to vitamin A therapy, although the dosage

was ample and 1 case received 18,500,000 units during the treatment. It is concluded that none of the cases were due to vitamin A deficiency.

A contagious disease of cattle associated with *Leptospira*, F. P. MATHEWS. (Tex. Expt. Sta. and U. S. D. A.). (*Amer. Jour. Vet. Res.*, 7 (1946), No. 23, pp. 78-93, illus. 11).—A febrile disease of cattle involving both epizootic and enzootic outbreaks is reported, as encountered on three ranches in Brewster, Presidio, and Jeff Davis Counties in Texas in the late summer and fall of 1942. Four forms of the disease were recognized; first, a slight illness of but a few hours' duration; second, a continuation of the first and followed by noticeable ill effects but eventual recovery; third, an acute fatal form characterized by hemoglobinuria and focal necrosis of the liver; and fourth, a chronic form characterized by parenchymatous and interstitial nephritis and a wide variety of other lesions. The mild forms of the disease were reproduced in seven calves by injection of blood from field cases, and the chronic lesions of the kidneys were reproduced in one out of six guinea pigs. Sheep, goats, and rabbits did not appear to be susceptible.

It is concluded that the pathology of the disease has much in common with that of leptospirosis in dogs. *Leptospira* were demonstrated in the tissues of some, but could not be found in all of the field cases. The serum of six experimental and three field cases did not agglutinate either *L. canicola* or *L. hemorrhagiae* antigens, and *Leptospira* has not been proved to be the cause of this disease.

Penicillin in the treatment of bovine mastitis, F. W. SCHOFIELD (*Canad. Jour. Compar. Med. and Vet. Sci.*, 10 (1946), No. 3, pp. 63-70; *Fr. abs.*, p. 70).—Penicillin assays of milk drawn at various times after udder infusions indicated that penicillin is very variable in the rate at which it is absorbed from the udder. Infusion results obtained by the author, using different degrees of concentration and periods of inhibition, are tabulated, and "up to the present compare very unfavorably with those quoted by other investigators." The work recorded and discussed is regarded as of a preliminary nature, but the following conclusions are drawn:

"*Streptococcus agalactiae* infection of the bovine udder may be resistant to penicillin when given in a unitage and frequency sufficient to produce a reasonable level of inhibition. (No penicillin-resistant strains have so far been encountered.) Acute mastitis, when due to either *Staphylococcus aureus* or *Corynebacterium pyogenes*, shows moderate clinical improvement only when treated with penicillin unless the treatment is commenced immediately after the infection is established. With immediate treatment, the results may be highly satisfactory. The best results are obtained when an inhibitory level of penicillin is maintained for 3 consecutive days. There is evidence to show that *Streptococcus agalactiae* is more resistant to penicillin in acute outbreaks of mastitis than when the organism is present in the udder unaccompanied by any clinical manifestations of disease."

Penicillin in peanut oil with 3 per cent beeswax: Local use in bovine staphylococcal mastitis, J. W. WALKER (*Jour. Amer. Vet. Med. Assoc.*, 108 (1946), No. 831, pp. 413-421, illus. 5).—Several experiments are reported with injections of peanut oil and beeswax and penicillin in various concentrations. These preparations were found to be relatively nonirritating to the bovine udder and effective against either streptococcus or staphylococcus infections.

"Though penicillin is not as effective against staphylococci as it is against streptococci, it is apparently more effective than any other known therapeutic agent against staphylococci. At present, it is impossible to

state the optimum dosage, but a rather high level of dosage seems indicated. The testing of a specific infection for sensitivity to penicillin is desirable in resistant cases."

The concentration of penicillin in fore milk following intramammary infusion for the treatment of mastitis—preliminary report, W. G. STEVENSON (*Canad. Jour. Compar. Med. and Vet. Sci.*, 10 (1946), No. 3, pp. 82-83; *Fr. abs.*, p. 83).—Twelve hr. after the infusion into all four quarters of 25,000 Oxford units of sodium penicillin, 14 Oxford units were found to persist in the fore milk. It is concluded that penicillin is not rapidly destroyed in the bovine mammary gland, and suggested that a longer interval between infusions may be satisfactory for cows that are dry or giving only a few pounds of milk daily.

Rinderpest, I-XVI (*Amer. Jour. Vet. Res.*, 7 (1946), No. 23, pp. 133-237, *illus.* 8).—This series of 16 papers, together with a foreword (pp. 133-134), deals with a project carried on during World War II on an island in the lower St. Lawrence River with a joint United States-Canadian scientific staff and Canadian army service personnel. This project included two problems: "The first was to prepare a tissue vaccine according to methods previously developed, in order to provide rapidly the means of surrounding an epizootic, should it occur, with a ring of immunized animals. The success of this procedure is indicated in the third paper in the following series. The second problem was to investigate the possibility of developing an efficient vaccine which could be produced more economically and without requiring the use of large numbers of animals. Subsequent papers in the series detail the manner in which the virus was adapted to embryonated hen's eggs and attenuated for cattle with retention of high antigenic properties. The final papers in the series indicate the methods used in the large-scale production and testing of the avianized vaccine."

The several papers are as follows: I, The Cultivation of Rinderpest Virus in the Developing Hen's Egg, by R. E. Shope, H. J. Griffiths, and D. L. Jenkins (pp. 135-141); II, Certain Immunity Reactions, by R. V. L. Walker, J. A. Baker, and D. L. Jenkins (pp. 142-144); III, Immunization Experiments With Inactivated Bovine Tissue Vaccines, by R. V. L. Walker, H. J. Griffiths, R. E. Shope, F. D. Maurer, and D. L. Jenkins (pp. 145-151); IV, Infection of the Embryos and the Fluids of Developing Hens' Eggs, by R. E. Shope, F. D. Maurer, D. L. Jenkins, H. J. Griffiths, and J. A. Baker (pp. 152-163); V, Attempts to Prepare an Effective Rinderpest Vaccine From Inactivated Egg-Cultivated Virus, by F. D. Maurer, R. V. L. Walker, R. E. Shope, H. J. Griffiths, and D. L. Jenkins (pp. 164-169); VI, The Persistence of Virus in Chicks Hatched From Infected Eggs, by R. E. Shope and H. J. Griffiths (pp. 170-173); VII, The Attenuation of Rinderpest Virus for Cattle by Cultivation in Embryonating Eggs, by D. L. Jenkins and R. E. Shope (pp. 174-178); VIII, Rinderpest Infection in Rabbits, by J. A. Baker (pp. 179-182); IX, Neutralization Tests in Rabbits as a Measure of the Immune Responses in Calves to Vaccination Against Rinderpest, by D. L. Jenkins and R. V. L. Walker (pp. 183-188); X, The Response of Guinea Pigs to the Virus of Rinderpest, by J. A. Baker, J. Terrence, and A. S. Greig (pp. 189-192); XI, The Survival of Rinderpest Virus in Various Mediums, by F. D. Maurer (pp. 193-195); XII, The Successful Use of Young Chicks to Measure the Concentration of Rinderpest Virus Propagated in Eggs, by J. A. Baker and A. S. Greig (pp. 196-198); XIII, The Production of Rinderpest Vaccine From an Attenuated Strain of Virus, by M. W. Hale and R. V. L. Walker (pp. 199-211); XIV, Immunization Experiments With Attenuated

Rinderpest Vaccine Including Some Observations on the Keeping Qualities and Potency Tests, by M. W. Hale, R. V. L. Walker, F. D. Maurer, J. A. Baker, and D. L. Jenkins (pp. 212-221); **XV, Morphological Changes in the Blood of Young Cattle During Rinderpest and After Vaccination With Attenuated Virus Vaccine**, by T. O. Robey and M. W. Hale (pp. 222-227); and **XVI, Complement Fixation Test for Rinderpest**, by H. K. Cooper (pp. 228-237).

Some observations on the blood leucocyte picture in bovines during reaction to the intradermal tuberculin test, G. H. ARTHUR (*Vet. Jour.*, 102 (1946), No. 6, pp. 147-157, *illus.* 1).—Total and differential leucocyte counts were made before, and at intervals during, the reaction to the double intradermal comparative tuberculin test in a group of 10 heifers, and in 5 nonreacting animals. The initial and second tuberculin injections were followed by marked increases in the total leucocyte counts and by a significant narrowing of the lymphocytic-neutrophilic ratio in the reacting group, but no such changes occurred in the nonreacting group. In one reacting animal investigated at 2-hr. intervals during the tuberculin test the maximum blood change occurred 6 hr. after the second injection of tuberculin.

Eosinophilia did not occur except in the 1 animal studied individually, where the count was 29 percent at 12 hr. after the second tuberculin injection. Neutrophilia was accompanied by an increase in skin measurement, but no proportional relationship was found to exist between them. The greatest change in the blood picture occurred later than the maximum skin reaction. The leucocytic changes in animals which had been reacting to the tuberculin test for 1½ yr. were similar to those which occurred in reactors of a few months' duration.

Koboltmangelens betydning som sykdomsarsak hos storfe og sau belyst ved terapeutiske forsok (The therapeutic effect of small doses of cobalt in combating deficiency diseases in cattle and sheep in Norway), F. ENDER (*Norsk Vet. Tidsskr.*, 58 (1946), No. 4, pp. 118-143; *Eng. abs.*, pp. 141-142).—The therapeutic importance of supplying cobalt to affected animals is shown by results of experiments which embraced the treatment of more than 1,000 cattle and sheep. On the average, treatment with cobalt alone led to recovery in 90 percent of the cases reported. The rapid and successful effect of cobalt medication was striking. It is concluded that from an etiological standpoint lack of cobalt must be assigned greater importance than lack of copper in the deficiency diseases in livestock.

Studies on enzootic staphylococcal infection in lambs associated with tick-bite.—II, The bacteriology of the disease, A. MCDIARMID (*Vet. Rec.*, 58 (1946), No. 22, pp. 243-244).—In this continuation of the study (E. S. R. 95, p. 246), 19 strains of staphylococci were isolated from 14 lambs affected with pyemia. Thirteen were classified as virulent strains of *Staphylococcus aureus*, 2 were deficient in a toxin, and 4 were avirulent and did not produce α or β toxins. These strains could be distinguished by a variety of tests. The view is expressed that the strains deficient in one or both toxins were not another species of *Staphylococcus* but represented strains that had lost some of their virulent characters as a result of subcultivation.

Experiments on the pathogenicity of hookworm (*Bunostomum trigonocephalum*) infections in lambs fed an adequate diet, J. T. LUCKER and E. M. NEUMAYER. (U. S. D. A.). (*Amer. Jour. Vet. Res.*, 7 (1946), No. 23, pp. 101-122, *illus.* 5).—Heavy experimental infections with *B. trigonocephalum* were produced in eight male lambs of mixed breeding and from 4 to 4.5 mo. old when the first experiment began. This hookworm was found to be

pathogenic, causing the lambs to become anemic and depressing their rate of growth. Lighter infections were less serious, with temporary anemia and interference with growth.

When 5,000 or 50,000 larvae were given orally, far lighter infections resulted than when these numbers of larvae were applied to the skin. However, exposure of lambs to percutaneous infection by extremely large numbers (560,000 to 580,000) of larvae apparently provoked processes, of undetermined nature, which were highly effective in inhibiting the development of adult worms. It is concluded that neither acquired nor age resistance can be regarded as adequately explaining the relatively light infections produced by these large larval administrations.

Differential counts showed that all significantly infected lambs had a degree of eosinophilia related directly to the magnitude of their hookworm burdens. Such infections also tended to cause slight monocytosis and basophilia. In each experiment, the degree of anemia observed in significantly infected lambs tended to be directly related to the magnitude of the per-gram counts of hookworm eggs passing in their feces and to the magnitude of their hookworm burdens. The anemia of the heavily infected lambs was normocytic, but tended to be hypochromic.

Ten per cent cunic for controlling gastrointestinal helminthiasis in sheep, J. H. WHITLOCK. (Cornell Univ.). (*Cornell Vet.*, 36 (1946), No. 1, pp. 47-50, *illus.* 1).—This report establishes the fact that 10 percent cunic (copper sulfate and Black Leaf 40) is no more toxic and much handier to give than 1 to 2 percent drenches. Control of helminthiasis was good in those flocks that were given phenothiazine or tetrachloroethylene at the start of the season and subsequently dosed with 10 percent cunic.

A preliminary report on use of lead arsenate for removal of the sheep tapeworm, *Moniezia expansa*, J. W. WARD and J. W. SCALES. (Miss. Expt. Sta.). (*Jour. Amer. Vet. Med. Assoc.*, 108 (1946), No. 831, pp. 425-426).—Treatment of 13 lambs with from 0.5 to 1 gm. each of lead arsenate in a gelatin capsule checked their diarrhea and each animal expelled from 10 to 150 chains of segments of *M. expansa*. Two animals were re-treated 5 weeks later. The results "indicate that lead arsenate is useful in the control of tapeworms in lambs in that clinical symptoms subsided after treatment and the animals made an uneventful recovery."

Observations on the prophylactic and curative value of sulfaguanidine in swine coccidiosis, J. E. ALICATA and E. L. WILLETT. (Hawaii Expt. Sta.). (*Amer. Jour. Vet. Res.*, 7 (1946), No. 23, pp. 94-100, *illus.* 3).—In the course of six experiments, each of 18 young pigs were experimentally infected with 20 to 30 million oocysts from mixed cultures of *Eimeria deblickei* and *E. scabra*. Five of the pigs were used to determine the prophylactic value of sulfaguanidine, 5 to determine its curative value, and 8 as controls. The treated pigs received the drug, mixed with feed, at the rate of 1 gm. per 10 lb. of body weight. Prophylactic treatment started 2 days before experimental coccidial infection and continued on the day of infection and for 7 or 10 more days. In the curative treatment, the drug was administered for 3 days starting with the second day of oocyst discharge.

All the pigs which received prophylactic treatment remained normal and made satisfactory body gains. Untreated control pigs developed diarrhea, lost appetite, and made either little or no body gain. It is concluded that "prophylactic use of sulfaguanidine inhibits the life cycle of [these] species of swine coccidia and prevents symptoms associated with the disease. When given as a cure, the drug brings about a reduction in oocyst output, thus pre-

venting the spread of the disease, and may also bring about a quicker termination of the diarrheal condition."

Studies on the validity of swine erysipelas culture-vaccines, L. VAN ES, J. F. OLNEY, and I. C. BLORE (*Nebraska Sta. Res. Bul. 145 (1946), pp. 30, illus. 34*).—A series of experiments undertaken by the station to determine what influences might be accountable for the production of inferior vaccination materials is reported. The publication deals with modes of procedure, analyses of the average validity, H-ion concentration, growth capacity, and approximate incubation periods, with notes and comments and a series of graphs.

It was found that the average validity of 10 vaccine cultures prepared in accordance with standard methods was acceptable, even if one of the component culture vaccines was valid only in the first incubation period and two others had become substandard in the third period. The presence of 0.5 percent glucose in the culture broth exercised a decidedly depressing influence on the average validity of culture vaccines grown therein. Culture vaccines prepared with beef heart broth treated with yeast prior to inoculation were of an acceptable validity only in the first period. Culture vaccines grown in liver broth failed to show acceptable validity.

The culture vaccine grown in broth furnished by a concern which at the time often failed to produce valid vaccine material showed a maximum validity only in the first period and proved to be nonacceptable in the other two. On the other hand, the culture vaccine prepared by a producer who had constantly succeeded in the production of acceptable materials presented a high degree of validity throughout. "There is warrant for the belief that the problem connected with subvalid culture vaccines can be solved only in the laboratories concerned, rather than by such attempts as described in this publication." Differences were observed in the validity of culture vaccines grown in broth, each of which was prepared with a different brand of peptone. In one of the two culture vaccines, the validity was high in the first period, barely acceptable in the second, and of substandard quality in the third. In the case of the culture vaccine grown in broth in which the other specimen of peptone was a part, an acceptable validity was attained in each of the three periods. In a parallel broth prepared without peptone, the culture grown therein was valid in the first and second periods but was markedly subvalid in the third. The value of peptone in the maintenance of bacterial longevity was demonstrated, and this may suggest that a reduction in the peptone contents of the culture broth may occasionally impair culture vaccine validity.

Room temperature incubation and storage did not prove to be harmful to culture vaccine validity, and apparently incubation at 37.5° C. in the preparation of culture vaccines may not be a necessity. The nature of glassware used in storage, the length of time after pigeon passage, agitation, the fat content of beef hearts, and a degree of putrefication did not appear to influence culture vaccine validity.

Orchitis in swine due to *Brucella suis*, H. C. H. KERNKAMP, M. H. ROEPKE, and D. E. JASPER. (*Minn. Expt. Sta. and U. S. D. A.*). (*Jour. Amer. Vet. Med. Assoc.*, 108 (1946), No. 829, pp. 215-221, illus. 3).—Several cases are reported as "the result of observations and studies on what might be described as a fulminating enzootic of brucellosis in a herd of swine. It deals with the incidence of the disease among the males in the herd especially, and with the clinical, pathologic, and bacteriologic findings thereof."

Changes in the equine larynx associated with laryngeal hemiplegia, C. R. COLE. (Ohio State Univ.). (*Amer. Jour. Vet. Res.*, 7 (1946), No. 23, pp. 69-77, illus. 10).—The factors considered in this study of 174 equine larynges were the changes in the muscles, the nerves supplying the muscles, and the cartilages of the larynx.

Penicillin dosage and blood levels for horses, E. R. DOLL and W. W. DIMOCK. (Ky. Expt. Sta.). (*Jour. Amer. Vet. Med. Assoc.*, 103 (1946), No. 829, pp. 209-214).—Data were obtained on the in vitro sensitivity to penicillin of a number of strains of organisms causing infections in horses. Blood-level responses from intramuscular administration of penicillin in saline solution were correlated with organism sensitivity in regard to therapeutic use of the drug. For *Streptococcus equi* infections (strangles) in horses, it appeared that the minimum dosage should be 300 units per pound of body weight every 3 hr. For infections caused by other streptococci, this dosage appeared adequate for only 2½ hr., while 500 units per pound probably sufficed for 3 hr. except in very young foals, in which 500 units per pound maintained a satisfactory blood level for only 2 hr. The resistance of *Shigella equirulis* to penicillin was high—2 to 4 units per cubic centimeter, and hourly dosage of 1,000 to 2,000 units per pound would not maintain completely inhibitive blood levels. The resistance of *Corynebacterium equi* was so great (8 to 10 or more units per cubic centimeter) that dosage for maintaining effective blood levels appeared impractical.

Precipitin-production in chickens.—II, Studies on the in vitro rise of the interfacial titers and the formation of precipitins, H. R. WOLFE and E. DILKS. (Univ. Wis.). (*Jour. Immunol.*, 52 (1946), No. 4, pp. 331-341).—Adult male chickens of various breeds were injected intravenously with serum proteins from cattle, buffalo, sheep, horse, goat, dog, or man. A detailed description is given of the in vitro use in the interfacial precipitative titer, and the relative value of the antisera produced is discussed.

Immunization against a lymphoid tumor of the chicken.—III, Attenuation by heat, drying, and chemicals, C. OLSON, JR. (Mass. Expt. Sta.). (*Cornell Vet.*, 36 (1946), No. 1, pp. 41-47).—Continuing this series (E. S. R., 94, p. 809), the growth capacity of the lymphoid tumor was attenuated by heat. When the growth capacity was destroyed, the immunizing ability was likewise lost. The tumor was relatively resistant to heat and not completely inactivated by exposure to 70° C. for 15 min. Dried tumor, necrotic tumor, and tumor pulp preparations treated with phenol or formaldehyde were inactive and did not induce resistance.

The toxicity of sodium chloride for fowls, J. D. BLAXLAND (*Vet. Jour.*, 102 (1946), No. 6, pp. 157-173, illus. 4).—In these experiments, although approximately 4 gm. of sodium chloride per kilogram of body weight were fatal to mature fowls when placed as a single dose directly into the crop, the same dose mixed into the food was not highly toxic in the case of four mature cockerels, housed individually, and no mortality occurred. No mortality could be attributed to sodium chloride poisoning when mash containing 5, 10, 15, and 20 percent, respectively, of salt were fed to mature fowls over a period of 4 weeks. When single feeds of mash containing 15, 20, and 30 percent, respectively, of sodium chloride were fed to groups of adult fowls, as far as possible under field conditions, a low mortality occurred with the higher concentrations. There was also no excessive mortality in growing chickens when mash containing 5, 10, and 15 percent, respectively, of sodium chloride were fed for 14 days. In the case of baby chicks, however, where sodium chloride was fed in the mash in a concentration of 10

percent, a 50 percent mortality occurred within 3 days and after 2 weeks there had been an 80 percent mortality. With a 5 percent concentration there was a 30 percent mortality in 3 days. When sodium chloride in solution, even as a normal saline (0.9 percent), was given instead of drinking water, a 100-percent mortality occurred within 5 days.

The effect of some aryl arsonic acids on experimental coccidiosis infection in chickens, N. F. MOREHOUSE and O. J. MAYFIELD (*Jour. Parasitol.*, 32 (1946), No. 1, pp. 20-24).—When given as a preventive in the drinking water of chickens, the two aryl arsonic acids 4-hydroxy phenylarsonic acid and 3-nitro 4-hydroxy phenylarsonic acid and their sodium salts were effective in reducing hemorrhage and mortality from the coccidium *Eimeria tenella*. 4-Hydroxy phenylarsonic acid was found to have some effects against the intestinal species of coccidia *E. acervulina*. Nontoxic doses were not effective. While 3-nitro 4-hydroxy phenylarsonic acid prevented mortality from *E. tenella* infection, the birds developed a considerable immunity toward subsequent infection with this species.

The incidence of erythroleucosis following inoculation by various routes, A. B. WICKWARE (*Canad. Jour. Compar. Med. and Vet. Sci.*, 10 (1946), No. 3, pp. 74-81).—In an attempt to solve the problem of the natural means of transmission, 163 chickens were inoculated by various routes. The results were corroborative in some degree of those obtained by other workers, but "also indicate the successful transmission of erythroleucosis by the instillation into the nasal cavities of heparinized whole blood and by the intravenous inoculation of salinized nasal washing of infected fowls." In 44 chicks hatched from apparently recovered pullets, there was no indication of the virus being egg-borne. Infection did not occur in any of the direct and indirect contact trials with birds of various breeds.

The transmission of lymphomatosis in the fowl, N. R. BREWER and B. BROWNSTEIN (*Amer. Jour. Vet. Res.*, 7 (1946), No. 23, pp. 123-128, illus. 2).—Tissue from a lymphomatous liver and spleen from a typical field case of lymphomatosis (uncomplicated by blood dyscrasia) was transmitted into White Leghorn chicks through 15 passages. In the fifteenth passage, 59 per cent of the birds died with lymphomatous lesions before they reached 100 days of age. Fifty per cent of these inoculated chicks were dead with lymphomatous lesions within 24 days. Chicks brooded with sibs inoculated with the infective tissue developed a significantly higher incidence of lymphomatosis than did controls. Chicks fed the infective tissue developed a significantly higher incidence of lymphomas than did the control sibs from the same hatches.

Newcastle disease and fowl plague investigations in the war research program, C. A. BRANDLY, H. E. MOSES, E. L. JUNGHERR, E. E. JONES, and E. E. TYZZER (*Jour. Amer. Vet. Med. Assoc.*, 108 (1946), No. 831, pp. 369-371).—This is a preliminary report on the facilities and procedures in this project and a summary of some of its more important results.

Perosis caused by feeding high levels of thiouracil, G. M. BRIGGS and R. J. LILLIE. (Md. Expt. Sta.). (*Soc. Expt. Biol. and Med. Proc.*, 61 (1946), No. 4, pp. 430-432).—Perosis, as characterized by an enlargement of the tibia-metatarsal joint and by a thickening and bending of the metatarsal, was obtained in young chicks by the feeding of relatively high levels of thiouracil (0.5 per cent) over a period of 5 weeks. The disorder was not prevented by the addition of manganese, choline, nicotinic acid, biotin, or riboflavin to the thiouracil-containing ration, but it is suggested that thyro-

xine may in some manner aid in the prevention of perosis under normal conditions.

Studies in pullorum disease.—VIII, The possible relationship of non-specific reactions to the sensitizing influence of ingested proteins, E. W. BOND (*Canad. Jour. Compar. Med. and Vet. Sci.*, 10 (1946), No. 3, pp. 71-73; *Fr. abs.*, p. 73).—Continuing this series (E. S. R., 94, p. 665), the possibility was investigated of a relationship between a high protein diet and the occurrence of nonspecific agglutinins for *Salmonella pullorum*. Tests using 100 New Hampshire pullets were made with meat meal, milk powder, soybean meal, and fish meal, but no relationship could be determined.

Sulfamerazine in the treatment of pullorum disease. G. W. ANDERSON. (S. C. Expt. Sta.). (*Jour. Amer. Vet. Med. Assoc.*, 108 (1946), No. 831, pp. 427-428).—Following a natural outbreak of pullorum disease in baby chicks in which treatment was not begun until 14 days after the onset of the disease, sulfamerazine was effective in reducing the mortality. It is regarded as being effective in such outbreaks if an early diagnosis is established and treatment is provided promptly.

Some observations on the control of fowl typhoid infection with sulfa drugs. D. F. HOLTMAN and G. FISHER. (Univ. Tenn.). (*Jour. Bact.*, 51 (1946), No. 3, p. 401).—An epidemic of fowl typhoid appearing in a flock of 400 week-old battery-raised chicks caused 20 percent mortality within 3 days. At this time the flock was divided into two groups. Group 1 received the usual care, consisting of removal of sick chicks, cleaning, and disinfection of the battery with cresol solution. Group 2 received no such care, but instead was given 0.1 percent sodium sulfathiazole in drinking water for a period of 1 week. At the end of the week, 80 percent of the chicks in group 1 had died. Losses in group 2 had been reduced to 4 percent, with no mortality during the last 3 days of the week.

The chicks in group 2 were taken off sulfa drug treatment and within 5 days the infection reappeared. Drinking water containing 0.1 percent sodium sulfathiazole was again supplied for 1 week, and the epidemic was checked with a 2 percent loss. After a second week without treatment another outbreak of the infection occurred, and the chicks were returned to still another week of sulfa drug treatment. At the same time, the battery was thoroughly cleaned and disinfected, and no further losses occurred after discontinuance of the treatment.

The occurrence of type 10 paracolon in turkeys. W. R. HINSHAW and E. MCNEIL. (Univ. Calif.). (*Jour. Bact.*, 51 (1946), No. 3, pp. 231-236).—Antigenic and cultural studies on a coliform organism isolated on 17 ranches from 15 outbreaks in turkey poults and found in adult carriers on 4 ranches showed it to be a paracolon designated by Edwards et al. (E. S. R., 90, p. 825) as type 10. The antigenic structure is XVIII: $z_{12}x_{12}$. The symptoms and pathology observed in these outbreaks resembled those seen in salmonellosis of turkey poults. The mortality ranged from 5 to 70 percent and was most severe during the first 14 days. Agglutination tests conducted on the survivors of acute outbreaks indicate that the infection is more easily aborted than is pullorum disease. The studies add additional evidence that this group of paracolons is of pathogenic significance.

Isolation of a type 10 paracolon bacillus from an adult turkey. H. C. GAUGER. (N. C. State. Col.). (*Poultry Sci.*, 25 (1946), No. 3, pp. 299-300).—A *Salmonella*-like organism isolated from a turkey hen serologically positive to a commercial pullorum stained antigen was identified at the Kentucky Experiment Station as a type 10 paracolon bacillus belonging to the

Arizona group with the antigenic formula XVIII: Z,X,X. The history of the case suggested that this strain was brought into North Carolina by way of infected hatching eggs from California.

Isolation of *Salmonella typhimurium* from the feces of turkeys, H. C. GAUGER and R. E. GREAVES. (N. C. Expt. Sta.). (*Poultry Sci.*, 25 (1946), No. 3, pp. 232-235).—The feces from six turkey breeders naturally infected with *S. typhimurium* were cultured on 17 to 44 days over a period varying from 52 to 70 days, and *S. typhimurium* was recovered from the feces of these six birds on 7, 5, 3, 8, 4, and 8 days, respectively. The total *S. typhimurium* isolations were 35, or 17.5 percent of 200 samples cultured. The last isolation of the organism was made from one bird on the sixty-fifth day of study. At autopsy the organism was recovered from the tissues of one of the six birds. The period during which *S. typhimurium* was isolated from seven artificially infected turkey hens not in production was relatively short. Feces were cultured on 8 to 22 days over a period varying from 20 to 118 days, and the organism was recovered from the seven birds on 3, 3, 4, 4, 3, 3, and 3 days, respectively. All isolations were made within 15 days after the birds were inoculated, and during this 15-day period 32 or 64 per cent of the 50 fecal samples cultured were positive for *S. typhimurium*. At autopsy the organism was recovered from the tissues of one of the seven birds.

Experiments in the use of sulfathiazole for turkeys, W. R. HINSHAW and E. McNEIL. (Univ. Calif.). (*Cornell Vet.*, 36 (1946), No. 1, pp. 66-70).—Neither sulfathiazole nor sodium sulfathiazole proved to be effective as a flock treatment for a respiratory disease of turkeys which is common on the West Coast, when given in doses readily accepted by the birds. The drugs were also ineffective against two outbreaks of acute fowl typhoid of turkeys. A deleterious effect on egg production was noted when adult turkeys were given in excess of 0.5 percent sulfathiazole in the mash. Feeds containing sulfathiazole, and water containing sodium sulfathiazole, were unpalatable, especially for young turkeys. Mash pellets containing sulfathiazole appeared to be more distasteful than dry mash containing the same level of the drug.

Field trials on the use of sulfamerazine for a respiratory disease of turkeys, E. McNEIL and W. R. HINSHAW. (Univ. Calif.). (*Poultry Sci.*, 25 (1946), No. 3, pp. 273-277).—Following the unsuccessful attempts to use sulfathiazole in the treatment of this disease noted above, beneficial results were obtained when sulfamerazine alone, or in combination with sulfathalidine (Soluble Sulfonamide II), was given in dry mash to turkeys in the early stages of a respiratory disease before the exudate in the air sacs became caseated. No advantage could be observed in using the combined drugs. The sulfonamide blood levels varied from 6 to 20 mg. percent at the 0.5-percent level in the mash and from 5 to 16 mg. percent at a dosage of 0.25 percent for longer periods. As in the treatment of fowl coryza (*Hemophilus* type) with sulfathiazole, symptoms reappeared after treatment was discontinued.

Limitations of phenothiazine in the control of cecal worms and blackhead disease of turkeys, E. E. WEHR and L. G. OLIVIER. (U. S. D. A.). (*Poultry Sci.*, 25 (1946), No. 3, pp. 199-203).—Three experiments, involving the rearing of chickens and turkeys together and of turkeys alone, were conducted. Parasite-free birds were placed on soil heavily contaminated with cecal worm eggs and held there for 4 to 6 weeks. During this time one-half of the birds received phenothiazine in the mash and the others were fed plain mash.

Chickens to which a mash containing 1 percent of phenothiazine and turkeys to which a mash containing 2 percent of phenothiazine were fed did not remain free of cecal worms, although the worms were evidently expelled before or soon after they reached maturity. No mature cecal worms were found at autopsy in any of the surviving treated birds or those dying from blackhead. The total number of immature cecal worms removed from the treated birds was about one-third of that removed from the control birds.

In general, there was no significant difference in the number of deaths in the treated and control groups. It is concluded that "regardless of the role that the cecal worm may play in the transmission of blackhead under natural conditions, the practice of feeding phenothiazine in the mash over a period of 4 to 6 weeks to prevent the propagation of this parasite cannot be expected to reduce appreciably blackhead disease."

AGRICULTURAL ENGINEERING

Ground water in the High Plains of Texas, W. N. WHITE, W. L. BROADHURST and J. W. LANG (*U. S. Geol. Survey, Water-Supply Paper 889-F, (1946), pp. 420+, illus. 12*).—Pumping from wells, begun more than 30 yr. ago, increased rapidly from 1934, when 300 wells were pumped, to 1939, in which year 1,700 wells were pumped for the irrigation of 230,000 acres. From measurements in a considerable number of wells in 1914, 1934, 1936, and 1937, and from other information, it is concluded that a large part of the water that has been pumped from wells in this region has been derived by reduction in underground storage.

Soil erosion in small irrigation furrows, O. W. ISRAELSEN, G. D. CLYDE, and C. W. LAURITZEN. (Coop. U. S. D. A.). (*Utah Sta. Bul. 320 (1946), pp. 39, illus. 20*).—From experiments, described as preliminary, upon a silt loam and a sandy loam on two farms and upon a sand used in laboratory work only, the following tentative conclusions are drawn: Irrigation furrow slopes of 2 percent and higher are excessive and cause harmful erosion during the irrigation of loose silty loam and sandy loam soils when streams of 10 gal. per minute, or more, are run into each furrow. Doubling the furrow slope more than doubles the erosion of loose silty loam and sandy loam soils. The erosion on a given furrow slope is dependent on the size of the irrigation stream and length of furrow, and doubling the stream more than doubles the erosion. In furrow slopes of 3 percent or smaller the erosion is less from flat furrows than from V-shaped furrows, and on slopes of 3 percent or higher the erosion is greater from flat furrows. The erosion of loose soil from V-shaped furrows is a maximum at the time when the water first reaches the lower end of the furrow, and it decreases as time advances. Under the conditions of the studies here reported, collecting samples of the water and eroded soil at furrow outlets as a means of measuring amount of erosion is superior to the cross-section method, which gave unsatisfactory results.

Grassed waterways, A. W. EMERSON. (U. S. D. A.). (*Farm Impl. News, 67 (1946), No. 9, pp. 36-38, illus. 7*).—The author notes that grassed waterways have been given "top priority" by Soil Conservation Service District supervisors in 1946. The importance of preserving natural sodded water outlets is noted, but the main emphasis is upon the filling and seeding or sodding of gullies and washes with reproduction, as nearly as possible, of the natural features of the original drainageway. Main advantages of the grassed waterway, in addition to the prevention of further water erosion and soil loss, are held to lie in the facts that sodded drainageways can usually be

crossed with farm machines even when the land is somewhat wet, and that the seeding or sodding eliminates an area which usually supports a growth of weeds, and, after thorough establishment of the grass, adds to the grass area which can be harvested. As essentials of successful practice the following are especially noted: (1) The channel must be sufficiently wide to carry the run-off from the drainage area—should be at least 1 rod wide at the narrowest point; (2) if a waterway has eroded or gullied it should be bladed or plowed in so as to widen and level the channel; (3) immediately after the channel is filled in, the soil should be packed and seeded to grass with a quick cover crop. Bromegrass is considered especially good for the Corn Belt because it forms a very good sod. Millet or Sudan grass are recommended as good in many areas for July 1 seeding, to be left unharvested for fall and spring protection or until the grass is established.

Rotary soil tillage, C. W. KELSEY (*Agr. Engin.*, 27 (1946), No. 4, pp. 171-174, *illus.* 9).—The author, president of a company manufacturing rotary tillage machinery, notes patents on rotary plows of unsuccessful design issued before 1860, and the introduction of a "revolutionary new principle" by von Mynberg in Switzerland in 1910. This principle was that of using small spring- or spring-mounted cutting tools, relatively high rotary speed, and the moving of only a small quantity of soil by each blade in any one revolution. Rotary tillage machines of the general nature indicated are described, and some problems met in their development are discussed.

Some rotary tillage applications, J. M. GREENE (*Agr. Engin.*, 27 (1946), No. 4, pp. 175-176, *illus.* 2).—The author, associated with a commercial manufacturer of tillage machines, briefly outlines development of rotary tillage equipment by his company, beginning with experiments on the use of a potato digger as a tillage tool. Applications of the rotary tillage principle here noted include the design and successful use of a machine driven by a tractor power take-off to destroy an infestation of white grubs in U. S. D. A. Forest Service nurseries, the same machines being subsequently used in the preparation of compost by the same agency. An example submitted by a large potato grower is cited, a part of a large field having been tilled by usual methods and a part subjected to rotary tillage. In a severe drought following planting, there were observed "dead and withered plants, the weed infestation, and the small, dwarfed potatoes grown in the section handled by conventional tillage as compared with the healthy plants and full-sized potatoes grown in the rotary-tilled section." The author notes, however, that the examples given represent application of rotary tillage by specialty growers, and that, although these specialized applications are important, "there is great need for well-planned research in the field of general agriculture." He points out a number of specific questions which can be answered only by such investigation.

Curing concrete with sealing compounds, R. F. BLANKS, H. S. MEISSNER, and L. H. TUTHILL (*Jour. Amer. Concrete Inst.*, 17 (1946), No. 5, pp. 493-512, *illus.* 2).—Following a brief general discussion of the principles involved in concrete curing, the authors take up methods for the effective use of sealing compounds for this purpose. Included are data for evaluating concrete curing by membrane treatment in terms of equivalent moist curing. The paper discusses preferred methods of curing by use of sealing compounds, and outlines a specification and acceptance test for their purchase.

Except under the most severe drying conditions, as for example during the summer months in the desert regions of the Southwest, it is believed that sealing compounds can be used to obtain the desired degree of curing.

They were found most effective in curing slab work, such as pavement and canal lining, where additional moisture is available from the subgrade, and they are least effective for thin sections and structural members having a high ratio of exposed area to volume. In examinations of much concrete canal lining, cured by various methods, it was noted that crazing of the surface concrete was reduced, or almost completely eliminated, when sealing compounds of the clear or white-pigmented type were used. The surface condition in this respect was improved over that of water or wet-burlap-cured concrete. Concrete cured with black compounds, which were not protected by whitewash, on the other hand, was found to be cracked and crazed more than similar concrete cured with water. When given a radiant heat reflective coating of whitewash, black bituminous sealing compounds were found to give satisfactory results. The whitewash weathered away nonuniformly, leaving the black paint mottled and unsightly, but this method of sealing could be used on concrete later to be backfilled.

A charcoal kiln made of cinder-concrete blocks, A. R. OLSON and H. W. HICOK (*Connecticut [New Haven] Sta. Bul. 494 (1946), pp. 30, illus. 5*).—It is noted that the wood distillation industry, though much stimulated during the war, has again been depressed by cheaper production of methanol, acetic acid, and acetone from materials other than wood to a point at which the charcoal needed by tobacco growers and numerous small industries can profitably be produced locally. For such production, relatively small kilns (of a capacity of from 1 to 2 cords) have been found more efficient than large brick kilns of the beehive type.

Of the two kilns of which the construction is here described and illustrated the smaller (net capacity, 1.1 cord) is shaped to house a 4 x 4 x 8 ft. cord, plus the necessary clearances for long sticks and for air and smoke passages. The 2-cord kiln (net capacity 1.9 cords) is 16 in. higher and 32 in. longer. The capacity of either of these kilns may be increased 25 percent by increasing the width 8 in. to accommodate 5-ft. instead of 4-ft. wood. This will not change appreciably the operations schedule given, but greater widths are not recommended, and in the opinion of the authors, any other increase in plant capacity can be better accomplished by increasing the number of kilns. Both kilns are of the chimney type, smoke being drawn from an opening near the base of one end of the kiln, against which opening a chimney stove is built to provide draft at the beginning of each burn by means of a small supplementary fire. Construction is mainly of standard 8 x 8 x 16 in. blocks, with pier blocks of the same and of half this length for corners and door frame, and 4 x 8 x 16 in. blocks threaded onto suitable lengths of 1¼-in. iron or steel pipe to form the roof. Detailed construction directions are illustrated by complete and fully dimensioned drawings. Bills of materials for kilns of both the sizes dealt with are appended. Operating directions cover loading, firing, coaling, closing and cooling, and opening the kiln, and illustrative timing schedules are tabulated.

How cotton ginning is affected by farm mechanized production, C. A. BENNETT. (U. S. D. A.). (*Farm Impl. News, 67 (1946), No. 10, pp. 46-48, 98, illus. 3*).—In general, mechanized cotton production requires additional cleaning, drying, and extracting equipment at the gin and slows down the ginning process. Cotton produced in the arid areas (western Oklahoma, Texas) can be stripped, sledged, or snapped, giving the ginner no serious problem. Cottons grown in areas of greater moisture supply, however, are much better harvested by the spindle picker, and the growth of the plant is more profuse, ranker, and leafier, and contains more moisture in addition to that introduced

by the spindle moisteners of the picker. Also the spindle picker, in spite of cleaning devices built into it, frequently tangles vines, grass, and green leaf into the lint in addition to the types of trash for the removal of which the ordinary gin cleaning equipment is designed. In the experimental studies here noted it was found possible, by using a machinery combination comprising a tower drier, 6-cylinder standard cleaner, big bur machine or master extractor, followed by 12 cylinders of special cleaner, and large size extractor feeders on the gin stands to increase bale values on machine-picked cotton about \$5 above those obtained from a conventional gin set-up of drier, 6-cylinder cleaner, and extractor feeder.

Other experimental work included handling and treatment of the crop before harvesting. Defoliating the cotton plants before the picking permitted the mechanical picker to produce lint averaging one-third of a grade higher than that from fields picked with the leaves on. Defoliation had also the advantages of early harvest, earlier release of the crop land, and better boll weevil control because early working of the soil reduced the food supply available to the weevils before hibernation; and it increased the efficiency of the picker by from 3 to 5 percent. Flame cultivation of the crop was of value because it eliminated grass from the machine-picked cotton. Flame-cultivated cotton yielded a product about one-third of a grade better than that from the hoed crop, whether the cotton was picked by machine or by hand.

New machinery and new haymaking methods in western Nevada, M. C. HARTLEY (*Nevada Sta. Bul. 177 (1946), pp. 22, illus. 19*).—This bulletin records results of a survey in which 63 reports from farms in four counties were studied "to determine, insofar as it was feasible, the advantages and disadvantages of the various methods used and kinds of machinery as applied to money cost, labor cost, machine efficiency, and quality of hay." Of the farmers interviewed, 37 used balers, 20 used choppers, and 6 used buck rakes. The last-named implement was used only for wild or meadow hay, however. Of the 37 using balers, 21 found the method to have the advantage of reducing the size of the crew, 17 found the baler to reduce the time spent in haying, 13 found it to make the work in the field easier, 11 found the baled hay easier to feed, and 11 found it to have a good market. Smaller numbers noted other advantages. Twenty-six found baling the most advantageous method in general for themselves, and 11 did not consider baling the method most advantageous to themselves. Of the 20 using choppers, all found this method the most advantageous to themselves, 15 that this method made field work easier and took less time, 13 could do their haying with a smaller crew with the chopper, 11 found the chopped hay easier to feed, and smaller numbers noted other advantages. Of disadvantages of either method, 8 noted the additional cash outlay for the baler, and 1 noted this against the chopper. Small numbers noted other disadvantages in the baler method, no other disadvantages in the use of the field chopper. Various other data obtained in the survey are tabulated and discussed, and reproductions of 19 photographs illustrate some of the less usual technics or equipment found.

Operation of hay driers in Virginia, R. E. MCKNIGHT. (Va. A. & M. Col.). (*Agr. Engin., 27 (1946), No. 4, pp. 166, 168*).—Introduced in a region of frequent rain, high humidity, and relatively low temperature, and begun with rather inefficient duct systems, barn hay drying is nevertheless rapidly gaining acceptance in Virginia. The first duct systems, based on T. V. A. recommendations, were designed for only about 10 cu. ft. of air flow per minute per square feet of mow floor, showed a high system resistance, and

gave very uneven pressure distribution. The design air flow was raised to 16 cu. ft. in 1945. Recommendations based on 6 years' experience are, in part, that alfalfa be cut at one-tenth to one-fourth full-bloom stage, other crops according to local advice; the cutting start as soon as most dew is off, no more being cut than can be put in the barn the same afternoon, or that cutting be done so late in the afternoon that no wilting occurs, the hay left in the swath overnight, and no more cut than can be put in the following afternoon; that in good curing weather, 2 hr. in the swath and 2 hr. in the windrow is sufficient; that the hay should be evenly distributed and uniformly packed over the duct system as unloaded; that not less than 4 ft. nor more than 8 ft. be put on the drier as a first loading, with additional loadings not to exceed 6 ft., and final total loading not over 15 ft. deep; that the fan should be started within 2 hr., at most, after the first hay has been put in, all mow doors and roof ventilators to be kept open during curing (a specific fan time-clock schedule is given); and that completeness of curing be tested by shutting off the fan overnight when the top foot of hay appears dry enough, turning on the fan again next morning, and immediately walking over the hay to ascertain if any warm air is coming out. If warm air is felt, the fan should be operated during two more days and rechecked.

In response to an inquiry sent the owner of every hay drier in the State (247 driers in all), the author received an unfavorable report from only one farmer. A number of favorable comments are quoted.

Seven years of hay drying experience, H. ANDERSON (*Agr. Engin.*, 27 (1946), No. 4, pp. 164-165).—A barn-drying and a load-drying system, already tried out in practice, and a projected field-drier method are described by the farmer who devised them. All three methods use heated air.

An ordinary unheated air system having given trouble with mold, a furnace of native stone 7 ft. square and 7 ft. high was built and connected to the barn air intake through a 3 ft. by 7 ft. flue built on the ground and making five 180° turns before entering the barn. Only a part of the air intake was taken from the furnace, and air movement through the flue was slow enough to permit all sparks to drop out, especially at the turns.

The second method of drying with heated air involved drying in open-bottomed racks, of which a number sufficient for storage of the hay were built, together with six 2-wheeled trailers, six sheet-metal ducts 18 in. in diameter and about 4.5 ft. long, and open wooden ducts, 12 in. square and 6 ft. long, of which as many were made as of the racks. In beginning the loading of each rack, one of the metal ducts was placed vertically in the center and held in place by a pin. When the rack was about half loaded, one of the wooden ducts was placed lengthwise of the load on the top of the vertical duct and the load completed to total about 5 tons of the partially cured hay. Such loads were run, six at a time, over six 18-in. diameter outlets of an underground, concrete tile duct system through which heated air from a stoker-fed furnace was driven by a 3 ft., 3-hp. fan. The outlets were connected to the vertical ducts in the loads by means of airtight canvas socks. With the fan blowing air heated to 110°F. through the hay overnight, the hay was dry in the morning. The further handling of the racks of cured hay for storage and feeding is also described. Palatable hay of good quality was produced.

A new plan calls for stemcrushing under hot air blast, followed by passage of the hay between two open aprons, of a length sufficient to permit complete drying of the hay by warm air passing through it, and from the aprons to a baler; the whole operation to be carried out in the field directly after cut-

ting. It is intended to heat the air for this process with an oil burner. It is estimated that the cost of such equipment would be about \$5,000, and that the equipment would handle the hay drying for five farms otherwise requiring \$1,000 expenditure each for a barn hay-curing setup.

Equipment for handling partially cured hay, C. N. TURNER (*Agr. Engin.*, 27 (1946), No. 4, pp. 163, 165).—The author discusses trial barn hay-drier installations worked in cooperation with farmers whose harvesting covered most of the older and newer methods of handling partially cured hay. Though the majority used the side-delivery rake, hay loader, wagon, and hay fork, three farmers used the buck rake and the wind stacker from the rear of the threshing machine. Five used the pick-up field harvester and the hay chopper or blower at the barn. Six used the field pick-up baler both with and without the conveyor handling equipment at the barn, and two the hay loader and truck with the regular hay chopper blower at the barn.

Though a large majority of farmers will judge the barn drier as used with the loader, wagon, and fork handling method, the author is of the opinion that "if the quality of barn-cured hay is sufficient to warrant the additional cost of the barn-curing operation, mechanization of the harvesting operation will probably be warranted by the saving in labor and human effort." Of the transport buck rake, made from a used car or truck, and the old threshing machine wind stacker, he holds that this form of mechanization requires the least capital investment, the least labor, and is the cheapest method of putting hay on the drier when the fields are within $\frac{1}{2}$ mile of the barn. With respect to either field harvester or loader and truck used with a hay chopper, it is emphasized that the hay should not go into the mow with more than 35 percent moisture content, that care must be taken to avoid overloading the mow because of the greater density of chopped hay, and that adequate air volume cannot be forced through chopped hay of a depth of more than about 14 ft. in the mow. The field pick-up baler and conveyor as combined with barn drying is also discussed, as are conditions and methods for barn drying of baled hay, which is regarded as having about the same density as chopped hay and, accordingly, about the same extra power requirement, in comparison with loose long hay, as does chopped. It is further noted, with respect to baling before drying, that few pick-up baling machines make a satisfactory loose bale and most of them are not built to handle hay containing over 25 percent moisture.

Distribution of air in long hay, A. W. CLYDE. (Pa. Expt. Sta.). (*Agr. Engin.*, 27 (1946), No. 4, pp. 159-161, illus. 2).—By means of an apparatus, here illustrated, for a laboratory study of the flow of air through hay, the author found that the resistance to the flow of air through such material apparently does not follow the law of proportionality of the resistance to the square of the velocity, as in ducts and fixed orifices, but increases at a lower rate due, possibly, to displacement of material and enlargement of air passages. In measuring the air flow out of the hay at various points, the author found the use of a funnel placed with its larger end against the hay and an anemometer at the smaller end to give rough comparisons only, and to require careful calibration if it is to give quantitative results of any value. With a funnel having an area ratio of 20 : 1, the measured exit velocity was from one-third to one-half of the velocity believed actually to exist. Uneven distribution of the air flow due to uneven density seemed to be unavoidable at points where additional hay is repeatedly dropped from a carrier and at points where men stand in moving the hay. A density of 8.4 lb. to the cubic foot after the hay was dried was found under the hay

track in one instance. This difficulty was obviated by two farmers by building platforms upon which the hay was dropped and from which it was distributed.

Corrective measures suggested by the author include a timber so placed as to break the fall of the hay. He also has considerable confidence "that blowing uncut hay into the mow will make for more even density as well as leaving the hay loose and easy to blow air through." Uneven air distribution due to low resistance against escape of air from the sides was reduced, though not entirely prevented, by putting up a smooth wall 6 ft. high against the open side of the hay. Removal of sections of this wall resulted in a strong outflow of air and a reduction of pressure in the duct. It is suggested that side loss might be reduced by restricting ducts to an area 8 ft. from the side walls. It is pointed out, however, that this might leave room only for a main duct, with the possibility of a high entrance resistance. Part or all of the duct might be extended to a height of from 6 to 8 ft. above the floor to take advantage of the tendency of the air to leave from the sides. Concerning the use of built-in resistance in the duct system, the author doubts whether the power loss could be spared from the limited fan horsepower which can be provided. Throttle control of side ducts opening into low-resistance parts of the mow is also discussed. As a final improvement suggestion, two-level duct systems are considered, to avoid the illogical "attempt to blow air through 15 or 20 ft. of hay . . . to dry the last foot." Though wooden second-level ducts have not seemed practicable, it is believed that ducts of sheet metal or of wire mesh might be more adaptable to such use.

Resistance of hay to air flow and its relation to design of barn hay-curing equipment, C. K. SHEDD. (Iowa Expt. Sta. coop. U. S. D. A.). (*Agr. Engin.*, 27 (1946), No. 4, pp. 169-170, illus. 2).—The author measured the resistance of a mixed hay of bromegrass and alfalfa and a nearly pure alfalfa hay to air flow in an apparatus the same as that used by him in studying the air flow resistance of ear corn (E. S. R., 93, p. 201) except that an inclined-tube water manometer was employed for determining the static pressure in the plenum chamber under the false floor in the measurements of hay resistance. Each lot of hay was tested at 10, 15, and 20 c. f. m. per square foot of floor area. The results are shown numerically and as plots of the data on logarithmic scales, a method having the advantage that a straight line plot shows that the data conform to the equation $Q = aP^b$, in which Q = air flow in cubic feet per minute per square foot, P = static pressure, or pressure drop through the hay, in inches of water, and a and b are constant for a given depth and condition of the hay. For hay, the value of the exponent b varied from 0.71 to 0.77, average about 0.75, a figure which the authors compare with corresponding values of 0.50 for ear corn, 0.68 for shelled corn, 0.88 for grain sorghum and for oats in pointing out that "all of these results indicate that air flow through porous materials may not follow the law that velocity varies as the square root of pressure head, but that the velocity may vary as some other power of pressure which can be determined only by experiment."

Apply these results to barn hay-drier design, the author shows that although an air flow of 10 c. f. m. per square foot has sometimes been found insufficient to cure the hay without some spoilage, the suggested remedy of increasing the flow to 15 c. f. m. would increase static pressure by the factor 1.8 and the power requirement by the factor 2.7, the calculation covering only the resistance within the hay itself. The proposed flow of 15 cu. ft.

cannot, therefore, be obtained "without some improvements in design" within the probable practical limit of 5 hp. set by the usual limit of farm transformer capacity. Other applications of the results here recorded to barn drier design are also suggested.

Curing hay in the stack with forced air, J. H. RAMSER and E. W. LEHMANN. (Univ. Ill.). (*Agr. Engin.*, 27 (1946), No. 4, pp. 167-168, illus. 4).—The experiments here reported upon were made with the purpose of developing a method for producing high quality hay where neither barn-curing space nor electric power are available. Essential differences between the plan here described and earlier stack drying methods lie in the type of duct, the special design of the portable blower, and the use of a porous fiberglas tarpaulin to cover the upper part of the stack for protection against rain and to equalize the air flow through the hay.

The main duct took the form of an A frame 14 ft. long. The framework was built of 2 x 4's 2 ft. apart, covered with 1 x 4-in. strips 1 ft. apart. The over-all cross-sectional dimensions of the A frame were 3 ft. wide at the bottom and 1 ft. at the top with a vertical height of 5 ft. This gave a free area for air passage of approximately 6½ sq. ft. From the fan and motor enclosure to the A frame, a tight connecting duct 8 ft. long with framing inside was used. To ventilate at hay over this connecting duct, slots 1½ in. wide extending halfway from the A frame to the motor enclosure were left on each side at the bottom and in the center of the top.

A 15-hp. internal-combustion engine, such as is used on a small tractor, was used and was directly connected to an 8-blade propeller-type fan. The fan and engine unit was enclosed by a 5- by 5-ft. structure so that all the air to the fan passed over the engine. The heat given off by the engine raised the temperature of the circulating air approximately 5°F.

A commercial moisture-resistant paper was placed under the stack to prevent damage by moisture from the ground. The base of the stack extended 8 ft. in all directions from the A frame, making the base dimensions of the stack 19 by 30 ft. The sides of the stack were sloped about the same as the sides of the A frame, and the stack extended 8 ft. above the top of the frame, making a total height of 13 ft. and approximately 13 ft. across the top.

Some operational data given are considered to indicate that the cross-section area of the main duct should be increased to lower unnecessarily high air velocities.

Peach research aided by new machine, G. W. GILES and O. VEERHOFF (*Res. and Farming [North Carolina Sta.]*, 4 (1946), *Prog. Rpt.* 2, pp. 4-5, illus. 1).—This machine, described as a "counter-sizer," counts and records the peaches in each size when attached to a commercial grader that drops all peaches into one of four sizes. The entire machine is powered by a small gasoline engine. Peaches are picked up individually by the machine at one end and carried through it by cups attached to two parallel endless belts. The weight of the peach causes the cup to trip at the proper weight-size bin, and, at the same time, the movement of the cup is transferred through a lever system to a counter for that weight-size. In order that fruit from small blocks of trees could be run, the two belts were set up so that they could be run separately, with a separate set of counters for each belt. Grading could then be done faster because a sample could be run on each belt, at the rate of 100 peaches per minute.

Cold storage design for apples and pears, W. V. HUKILL and E. SMITH. (U. S. D. A.). (*Refrig. Engin.*, 51 (1946), No. 5, pp. 419-422, illus. 2).—

This paper (covering in condensed form the topics of precooling; capacity and height of rooms and their lay-out; fans, ducts, and air flow; and handling equipment) consists of excerpts from U. S. D. A. Circular 740 E. S. R., 94, p. 814).

Technical phases of home freezer development, C. E. LUND (*Refrig. Engin.*, 51 (1946), No. 6, pp. 513-520, illus. 13).—The author first considers cabinet dimensions, limited in width to 29 in. by the average width of doorways and in height by the need of easy accessibility for persons of less than normal stature, leaving only length variable for possible variation in capacity. Experimental data affecting the design are concerned with effects of insulation thickness, temperature gradients with and without load, effects of 2.5-in. and of 4-in. lid insulation (the thicker insulation reducing the running time of the cooling unity by only 3 percent in a 9-cu.-ft. cabinet held to 0° F. in an ambient air temperature of 100°), temperature gradient through a loaded cabinet during warm-up (measured to determine the effect of power shut-off or mechanical break-down), vapor transmission sealing of cabinet wall, effect of single and double door gaskets on vapor transmission, performance data of home type freezer cabinets, etc.

The walk-in type of milking barn, F. B. HEADLEY (*Nevada Sta. Bul.* 176 (1945), pp. 5, illus. 2).—From experience with a barn of this type, built in 1944 by the station, the author concludes that a milking room need not be larger than 12 by 38 ft. to be sufficient for a 75-cow herd. Though there is additional expense for the individual stalls and a raised platform on which the cows stand, the lower cost of the small barn more than offsets this. Because each cow occupies the milking stall for usually less than 5 min., the walk-in barn is easier to keep clean, can be kept practically free from odors, and makes it easier to produce milk of low bacterial count. At the station barn, a milking rate of 25 to 30 cows per man per hour was attained.

The bulletin contains brief notes on milking procedure and number of stalls and shows the lay-out of a walk-in milking barn and dairy room.

Housing for pigeons, C. S. PLATT (*New Jersey Stas. Hints to Poultrymen*, 32 (1945), No. 5, pp. [4], illus. 2).—A practical discussion. The author advises that a detailed construction blueprint for a unit which accommodates 15 pairs of birds is available upon request.

AGRICULTURAL ECONOMICS

[Papers on agricultural economics] (*Jour. Farm Econ.*, 28 (1946), No. 1, pp. 409+).—Included are the following papers, with discussions on some, presented at the annual meeting of the American Farm Economic Association at Chicago, Ill., December 27-28, 1945: Postwar Agricultural Policy—Pressure vs. General Welfare, by O. B. Jesness (pp. 1-14) (Univ. Minn.); Changes in Economic Structure Affecting American Agriculture, by T. W. Schultz (pp. 15-27); Sixty Million Jobs and Six Million Farmers, by F. A. Pearson and D. Paarlberg (pp. 28-41) (Cornell Univ.); The Prospect for Postwar Agricultural Exports From the United States, by R. B. Schwenger (pp. 42-53) (U. S. D. A.); Food and Agriculture Organization of the United Nations, by P. L. Yates (pp. 54-70); Educational Opportunities and Responsibilities in Foreign Agriculture, by C. L. Stewart (pp. 71-80) (Univ. Ill.); Social Security for Farm People, by I. S. Falk and W. J. Cohen (pp. 84-96); also by K. H. Parsons (pp. 97-110) (Univ. Wis.); Research Developments in Farm Finance, by F. F. Hill (pp. 114-125) (Cornell Univ.); Research Work in Minimum Financial Requirements and Some Related Considerations for

Beginning Farming, by W. L. Cavert (pp. 126-133) (U. S. D. A.); Research Developments in Cooperative Marketing, by H. Hedges (pp. 134-140) (U. S. D. A.); Research and Educational Programs in the Marketing of Milk and Dairy Products, by A. MacLeod (pp. 144-157); Research and Educational Programs in the Marketing of Livestock, by C. D. Phillips (pp. 158-169) (Univ. Ky.); Some Considerations of Research in Marketing Horticultural Products, by H. R. Wellman and G. L. Mehren (pp. 170-181) (Univ. Calif.); Postwar Extension Problems in Agricultural marketing, by W. B. Stout (pp. 187-198) (U. S. D. A.); Postwar Extension Problems in General Agricultural Economics, by G. W. Westcott (pp. 199-212) (Mass. State Col.); Postwar Extension Problems in Farm Management, by C. Malone (pp. 213-226) (Iowa State Col.); Postwar Agricultural Problems in the Great Plains Area, by W. E. Grimes (pp. 235-242) (Kans. State Col.); in the Corn Belt by C. W. Crickman (pp. 243-260) (U. S. D. A.); and in the Dairy Regions, by L. C. Cunningham (pp. 261-264) (Cornell Univ.); Basic Weaknesses of the Parity Price Formula for a Period of Extensive Adjustments in Agriculture, by K. T. Wright (pp. 294-300) (Mich. State Col.); Parity Prices, by O. C. Stine (pp. 301-305) (U. S. D. A.); Agricultural Economists and Public Opinion, by L. J. Norton (pp. 306-310) (Univ. Ill.); Extension Use of Farm Work Simplification, by R. E. Proctor (pp. 314-319) (Univ. Ky.); An Analysis of Work Simplification Research Methods and Results, by L. S. Hardin and R. M. Carter (pp. 320-330) (Purdue Univ. and Univ. Vt.); and The Future of Farm Work Simplification Research, by E. C. Young and I. R. Bierly (pp. 331-337) (Purdue Univ. and Cornell Univ.).

Also included are: A topical digest of the winning papers in the farm price policy awards (noted on page 581), by W. H. Nicholls and D. G. Johnson (pp. 267-283); a discussion of the price policy award papers, by L. H. Simerly (pp. 284-289); and a discussion of the price policy winning papers, by R. K. Froker (pp. 290-293) (Univ. Wis.). A report, Adjustments in Southern Agriculture with Special Reference to Cotton (pp. 341-379), prepared by a special committee of the association; and the report, Outline of a Price Policy for American Agriculture for the Postwar Period (pp. 380-397), of the Committee on Parity Concepts, are given.

[Papers and notes on agricultural economics] (*Jour. Farm Econ.*, 27 (1945), No. 4, pp. 903-989, illus. 3).—Included are the following papers, with discussions: Wartime Experience in Production Adjustment Research and Future Possibilities, by N. W. Johnson (pp. 903-927) (U. S. D. A.); Mechanization of the Cotton Harvest, by F. J. Welch and D. G. Miley (pp. 928-946) (Miss. Expt. Sta.); A Critical Examination of Marketing Research, by F. L. Thomsen (pp. 947-962) (U. S. D. A.); and Analyzing Labor Requirements for California's Major Seasonal Crop Operations, by M. W. Lenhart (pp. 963-975). Notes are also included, as follows: Will Governmental Programs Alter the Structure of Government? by O. B. Jessness (pp. 976-980) (Univ. Minn.); Farm Real Estate Values in South Dakota and the BAE Index of Estimated Value Per Acre of Farm Real Estate, by G. Lundy (pp. 980-984) (S. Dak. State Col.); and The Consistency of U. S. D. A. Estimates of Possible Consumption and Prices of Beef and Pork in 1950, by Z. Szatrowski (pp. 984-989).

Changes in the apple industry in Maine, C. H. MERCHANT (*Maine Sta. Bul.* 440 (1945), pp. 35-63 +, illus. 9).—This report is based upon interviews with apple growers throughout the State in 1940 and in 1943 and 1944, concerning their orchards and the storage and marketing of the apple crops; on earlier surveys made by the station; and on United States census reports for

1924, 1934, and 1939, as to the number of trees, etc. Analyses are made of the trends in the number of apple trees in the State, varieties and ages of trees, size of orchards, and relation of size to varieties, etc., in commercial orchards. The kinds of storage, transportation facilities, methods of grading, packaging, and selling apples, and the changes in each are discussed.

From 1924 to 1939, according to the census, there was a decrease of 77 percent in the number of bearing apple trees and 74 percent in the number of nonbearing trees. Most of the decrease was in farm orchards and neglected commercial orchards. "A survey of 305 farms in 1943 and 1944 indicates that more than one-half of the apple trees are of the McIntosh variety. Also, a large proportion of the McIntosh trees are comparatively young and a relatively high percentage are not yet in bearing. The Delicious and Cortland varieties continue to increase in importance but not at the same rapid rate as McIntosh. The winter varieties such as Baldwin, Rhode Island Greening, Stark, and Ben Davis are declining in importance. The Northern Spy variety has sufficient young trees to maintain the present production of apples for several years. It seems reasonable to expect that future apple crops will consist very largely of fall varieties, especially McIntosh, with a distinct decline in winter varieties with the possible exception of Northern Spy." There was a definite trend towards larger orchards, and the trend is expected to continue. During recent years more and better storage facilities have been made available, and further development, especially of cold storage, is expected. An increasing quantity of apples has been moving into storage and to markets by trucks, and it is expected a higher percentage of the crop will be so moved in the future. The two most important changes in selling apples have been the change from barrels to boxes as containers, and the increase in the percentage of apples being sold to retailers and wholesalers and the decrease in percentage being sold to country buyers.

Costs and returns in broiler production. A. L. PERRY and G. F. DOW (*Maine Sta. Bul.* 441 (1945), pp. 65-116+, illus. 5).—Data were obtained from 170 broiler growers who raised at least 500 broilers each during the year ended June 30, 1944, regarding the costs, returns, and practices in raising chickens for meat. Analyses are made of the costs and returns and the factors affecting them. Among the factors and practices discussed are: Number of broilers raised per farm and per lot; type of producer; use of labor; rate of growth; mortality; source and price of baby chicks; sex of chicks, and separation of pullets and cockerels; breed of chickens; month chickens were started; age and weight at sale; chicks per stove, and space per chick; fuel used in brooder stoves; feeding and watering; use of range; type of litter and floors; use of lights; and use of credit. The quality and weight of broilers desired by buyers, markets and marketing channels, seasonality of marketing, and broiler prices are discussed briefly.

Production costs averaged 24.3 ct. per pound of meat and returns 29.1 ct. The average profit of 4.8 ct. per pound represented a labor return of \$1.40 per hour. Producers with less than 1,000 broilers per year had a profit of only \$76 as compared with \$2,567 for those raising 8,000 or more broilers. Of the production costs, feed comprised 63 percent, baby chicks 14, labor 14, use of buildings and equipment 5, and miscellaneous costs 4 percent. The daily labor requirement per 1,000 chicks started was 1.6 hr. for regular chores and 0.4 hr. for miscellaneous work. The average rate of growth per day was 3.8 lb. per 100 broilers. Variation in rate of growth accounted for a difference of 8.5 ct. per pound in the cost of production. Broiler Crosses and Plymouth Rocks made the most rapid gains and used feed more efficiently

than other breeds. Broilers sold at 14 weeks of age, at a weight of nearly 4 lb. per bird, had the lowest cost per pound of meat. Costs increased very rapidly for chicks kept to 20 weeks of age or older. An average of 4.5 lb. of feed was required per pound of meat.

Milk prices need adjustment seasonally to stimulate greater fall production, C. W. PIERCE (*Pennsylvania Sta. Bul.* 475 (1946), *Sup.* 1, pp. 6-8, *illus.* 2).—The problem and causes of fall shortages of milk in the Philadelphia market are discussed and suggestions made for seasonal adjustment in milk prices to stimulate greater fall production.

A price policy for agriculture, consistent with economic progress, that will promote adequate and more stable income from farming (*Jour. Farm Econ.* 27 (1945), No. 4, pp. 737-902, *illus.* 3).—Under an agreement of February 3, 1945, between the American Farm Economic Association and W. H. Jasspon, the donor of \$12,500, a contest was sponsored and conducted by the association for the best papers on the subject of Farm Price Policies. The awards were: First, \$5,000; second, \$2,500; third, \$1,250; and 15 additional awards of \$250 each. The specific topic announced for the contest was A Price Policy for Agriculture, Consistent with Economic Progress, That Will Promote Adequate and More Stable Income from Farming. The authors and papers receiving the principal awards were: First award, W. H. Nicholls (pp. 743-760), and second award, D. G. Johnson (pp. 761-772) (both Univ. Chicago); and third award, F. V. Waugh (pp. 773-784) (U. S. D. A.). The 15 additional awards were made to the following authors: G. W. Barr (pp. 785-789) (Univ. Ariz.), M. K. Bennett (pp. 790-797) (Stanford Univ.), G. P. Boals (pp. 798-806) (U. S. D. A.), K. Brandt (pp. 807-812) (Stanford Univ.), W. W. Cochrane (pp. 813-820) (U. S. D. A.), R. J. Eggert (pp. 821-828) (Amer. Meat Inst.), P. A. Eke (pp. 829-836) (Univ. Idaho), C. C. Farrington (pp. 837-843) (U. S. D. A.), R. K. Froker (pp. 844-851) (Univ. Wis.), C. D. Hyson (pp. 852-860) (Harvard Univ.), A. L. Larson (pp. 861-870) (Okla. A. and M. Col.), J. G. Maddox (pp. 871-877) and R. Schickele (pp. 878-885) (both U. S. D. A.), G. Shepherd (pp. 886-894) (Iowa State Col.), and L. H. Simerl (pp. 895-902) (Ill. Agr. Assoc.). The texts of the papers are given.

Brief statements are included by L. J. Norton, president of the association, regarding the contest, and by C. C. Davis, chairman of the award judges.

Cropland use and soil fertility practices in war and peace, D. B. IBACH (*U. S. Dept. Agr., Bur. Agr. Econ., 1946, F. M.* 52, pp. 58+, *illus.* 14).—"This report does not include data, quantitative estimates, suggestions, or discussion of all the important factors that are associated with soil fertility or other aspects of physical productivity. It is limited primarily to suggestions for postwar land use and practices considered by State production adjustment committees, compared with similar items for the prewar and wartime periods. . . . The terms 'prewar,' 'wartime,' and 'suggested postwar' refer to the periods of 1935-39, 1943, and about 1950 respectively, unless otherwise stated." The prewar, wartime, and suggested postwar use of cropland in the Corn Belt and the Lake, Appalachian, Southeast and Delta, Mountain and Plains, Pacific Coast, and Northeast States; fertility practices by regions and classes of crops, including consumption trends and suggested postwar use, suggested regional changes in fertilizer consumption and in extent of application, and suggested changes in use by classes of crops and pasture; consumption trends and suggested postwar use of lime; and the use of manure are discussed. Other sections deal with government measures

for maintenance of soil fertility; miscellaneous fertility and other practices, including winter cover crops, summer fallowing, and terracing and contouring; and the implications of wartime changes and suggested postwar changes, including farming adjustments and soil fertility, fertility losses and farming costs, fertilizer expenditures and agricultural adjustment payments, improved practices and production of export crops, and farming adjustments and agricultural output.

[Economic land classification in Virginia counties] (*Virginia Sta. Buls.* 373 (1945), pp. 9, illus. 1; 377, pp. 10, illus. 1; 380, pp. 9, illus. 1; 381, pp. 9, illus. 1; 387 (1946), pp. 8, illus. 1).—These bulletins continue the series (E. S. R., 95, p. 260). The counties covered are: Bulletins 373 Southampton, and 387 Loudoun, by G. W. Patteson and S. C. Shull; and 377 Augusta, 380 New Kent, and 381 Charles City, by G. W. Patteson and J. A. McCartney.

Typical family-operated farms, 1930-45: Adjustments, costs, and returns, W. D. GOODSELL, R. W. JONES, and R. W. BIERMAN (*U. S. Dept. Agr., Bur. Agr. Econ., 1946, F. M. 55, pp. 91+, illus. 24*).—This publication consists chiefly of tables and charts, with a minimum of discussion, and is intended primarily "for the administrators, the researchers, and the students and individuals who are interested in the various aspects of agriculture and agricultural development. It presents basic data on farm organization, production, production efficiencies, mechanization, investment, income, prices, costs, and returns to capital and labor in each year from 1930 to 1945 on commercial family-operated farms of given sizes and types in a number of the more important agricultural areas in the United States." Each of the farm units included is an "'area-type' farm organization which represents the great mass of commercial family-operated farms of the respective type in the area. In each particular, each 'area-type' farm is the mean or the average of commercial family-operated farms of given type, the limits of which span the practical range of family-size farms of the specified type in the designated area." Fourteen types of farms are included, as follows: Dairy, in central New York and in southern Wisconsin; cash-grain, hog-beef, hog-beef fattening, hog-feet raising, and hog-dairy, in the Corn Belt; wheat-corn livestock; wheat-small grain-livestock, wheat-roughage-livestock, in the Northern Plains; wheat and wheat-grain sorghum, in the Southern Plains; cotton-grain sorghum, in the Southern Plains; cotton, in the Black Prairie area, Texas; and cotton, in the Delta area of Mississippi. A map shows the location of the 14 types of farms included in the report and 12 others that have been studied. The terms used in the report are discussed under the headings: Size, investment, and income; allocation of net farm income; and index, numbers of production, costs and returns. Most of the index numbers are based on 1930-44 = 100. Supplemental tables are also included on the basis of 1935-39 = 100. Charts compare the following items for the 14 areas: Operator's net income; total farm expenses, rent and interest paid by operator, and operator's net income; total production and total production costs; combined average yields of major crops; production per hour of man labor and costs per unit of production; prices received and prices and wages paid; operating expense per dollar of gross farm income; equity of operators in their farms; and net rent as percent of current value of land and buildings and estimated value per acre of farm real estate. Tables show for each year, 1930-45, for each farm type, operator's net farm and net cash farm incomes; net farm income and return to operator and family labor; return per hour to all labor, total hours of labor used, and total farm investment; total cost per unit of production and production per

hour of man labor; and total production and operating expense per dollar of gross farm income. The location and characteristics of each of the typical farms are discussed, with charts covering 1930-45 showing for each farm the gross and net farm incomes, total expense, rent and interest paid, and operator's net farm income; and tables showing land use, livestock numbers, and distribution of income and expense, and investment, income, and related factors.

Typical family-operated farms, 1930-45: An historical look to the future, R. W. JONES and W. D. GOODSELL (*U. S. Dept. Agr., Bur. Agr. Econ., 1946, F. M. 56, pp. 24 +, illus. 13*).—Certain aspects of the material in F. M. 55, noted above, are dealt with more generally in sections entitled: What About Farmer's Income; Why Some Farmers Have Higher Earnings Than Others; Are Farmers Progressing Toward Owner-Operatorship; How Much of Gross Farm Income is Net; and Land Boom Ahead. The map showing the location of the types of farms studied and all the charts in F. M. 55 comparing the various items for the 14 types are included, except that showing production and production costs. Additional charts show the operating expenses per unit of production; production per farm; mechanization and size of farm; and why farmers' incomes differ.

Paying for a farm, J. L. ROBINSON and G. F. EKSTROM (*U. S. Dept. Agr., Farm Credit Admin. Cir. E-30 (1946), pp. 19, illus. 6*).—"This circular is designed chiefly as an aid to instructors of vocational agriculture in organizing teaching units on agricultural credit and for them and others in advising young men on credit problems related to the purchase of land and to the operation of farms." Certain principles that the Farm Credit Administration has found to be basic to the use of credit in farming are set up and supported by data obtained from research dealing with the relationship of land classes to debt repayment ability. The chief study was one of over 11,000 loans made by the Federal Land Bank of Spokane in 30 counties of Washington, Idaho, and Montana.

Cotton crop insurance in Tennessee and United States, B. D. RASKOFF and E. B. FICKEL (*Tennessee Sta., Agr. Econ. and Rural Sociol. Dept. Monog. 198 (1946), pp. 29 +, illus. 11*).—"This report covers: (1) Cotton crop insurance experience in Tennessee for 1942 and 1943, with some data for 1945 and 1946, and some comparisons with experience in other States, (2) loss experience on sample farms for the period of 1935 to 1941, and (3) factors for consideration in future planning." The section on cotton insurance experience deals with the extent of participation, average check rate and check yield, proportion of farms having losses, indemnities paid and premiums collected, and causes of indemnified losses. The section on factors for consideration in future planning discusses the yield trend; yield per acre; proportion of cotton acreage abandoned; volume, distribution, and value of the crop; the estimated reduction in yields due to climatic factors, diseases, insects, and other causes; and the loss experience on farms in the western part of the State. A bibliography of 18 references is included.

Federal crop insurance, available to Tennessee farmers on the cotton crops of 1942, 1943, 1945, and 1946, was carried by about 14,485 growers. This represents an average participation in the program by cotton producers of less than 5 percent. The low participation was largely due to high cotton yields during recent years and lower than average cotton crop losses.

Irrigation companies in Utah: Their activities and needs, O. W. ISRAELSEN, J. H. MAUGHAN, and G. P. SOUTH. (Coop. U. S. D. A.) (*Utah Sta. Bul. 322 (1946), pp. 62 +, illus. 25*).—This survey of the irrigation com-

panies of Utah is made in cooperation with the Utah State Department of Publicity and Industrial Development. It had for its major purposes "to obtain information concerning the supplemental water needs of Utah irrigation companies; to find the necessary physical improvements and additions to water storage and conveyance facilities; to define the major problems that must be solved in order to make the necessary improvements, and to assist public agencies toward coordinating irrigation research with planning and operations designed to improve irrigation facilities and increase crop production." The information was obtained largely by personal conferences with irrigation company officials, using a detailed schedule covering general information (history, management, etc., of the companies), water supply and irrigated areas, irrigation works, shares of stocks and annual costs, and irrigation company improvements and problems. It covered 509 companies, each irrigating over 300 acres, and 179 irrigating less than 300 acres each, the greater part of the analysis being on the data from the 509 companies. Tables show by counties and drainage areas the class of water supply as to adequacy and the need for supplemental water. The progress and possibilities of reservoir storage are discussed. Estimates are made by counties of the number and cost of diversion and conveyance works needed to be constructed, repaired, or altered. Farm irrigation improvements, water supply measurements, water delivery methods, water rights, annual costs, market value of irrigation stock, etc., are discussed. The functions and responsibilities of irrigation companies and the historical development of such companies in Utah are described.

[Haymaking methods], S. A. ENGINE, (*Minn. Farm and Home Sci. [Minnesota Sta.]*, 3 (1946), No. 3, pp. 8-10, illus. 4).—Tables and discussion based on visits to 80 southern Minnesota farms in 1945 show for different methods of putting up hay the man hours required per ton, tons of hay put up in 5 hr., size of crew, investment in and annual cost for haying equipment, and estimated cost per ton of putting up hay.

Marketing of cottonseed in Louisiana, J. F. HUDSON (*Louisiana Sta. Bul.* 400 (1946), pp. 26, illus. 3).—"The main purposes of this report are to analyze the agencies used by farmers in marketing cottonseed, the buying and selling practices of ginners, and the relationship between the average farm price of cottonseed and the value of the products obtained from cottonseed." The survey method was used in obtaining the data on methods and practices used in marketing cottonseed in the State. Ninety-five schedules were obtained from farmers and 49 from ginners located in the four cotton grade and staple divisions of the State. Among other subjects discussed are the farm income from cottonseed, marketing of the seed, proportion sold, time and place of sale, prices received, variations in grades, price margins, methods for determining weight of cottonseed, other trade practices affecting the ginners' price margins, and how margins might be reduced.

During the 1943-44 season, farmers sold 86.9 percent of the seed to ginners, 0.2 direct to oil mills, and 3.3 for planting seed, and retained 7.2 for home use as seed and 2.4 percent for feed for livestock and fertilizer. Eighty percent of the seed sold to ginners was sold at the time of ginning. The average margins per ton retained by ginners varied from -69 ct. to \$8.40, averaging \$3.65. The seasonal average value of cottonseed products produced per ton of seed crushed in 1943 was \$71.76 and the farm price \$51.60, or 71.9 percent of the value of the products.

The status of cooperatives in fruit and vegetable canning, 1943 and 1944, G. M. WEBER (*U. S. Dept. Agr., Farm Credit Admin., Misc. Rpt. 97 (1946)*),

pp. 15 +, *illus.* 4).—The total pack by cooperative associations, the location of canning cooperatives, the concentration of output in the larger associations, what fruits and vegetables cooperatives pack, and the outlook for the future are discussed. Tables show by States the number of cooperative associations canning seasonal vegetables and deciduous fruits and berries in 1944, with the annual average percentage of the total cooperative pack in 1943 and 1944; the number of associations packing the principal vegetables and fruits in 1939, 1943, and 1944; percentages of cooperative and total United States pack of the principal vegetables and fruits by specified vegetables and fruits in 1943 and 1944; and the per capita U. S. civilian consumption of fruits and vegetables, 1910-14 to 1940-43, and by years, 1940 to 1943. Charts show the U. S. production of vegetables, fruits, and citrus products, 1943 and 1944, and the percentages packed by cooperatives; and the per capita consumption by years, 1909-43, of canned vegetables and fruits, fruit and tomato juices, dried fruits, and frozen fruits and vegetables.

Agricultural statistics, 1945, R. K. SMITH ET AL. (*U. S. Dept. Agr., 1945, pp. 604 +*).—This annual volume (E. S. R., 93, p. 89), prepared under the direction of the Yearbook Statistical Committee, brings together in condensed form the more important series of statistics prepared in the Department or compiled by the staff for official use. The 710 tables are grouped under the headings: Grains; cotton, sugar, and tobacco; oilseeds, fats, and oils; fruits, vegetables, melons, and tree nuts; hay, seeds, and minor field crops; beef cattle, hogs, sheep, horses, and mules; dairy and poultry products; farm capital and income; agricultural conservation and adjustment; and miscellaneous statistics.

Farm production, farm disposition, and value of principal crops, 1944-45, by States (*U. S. Dept. Agr., Bur. Agr. Econ., 1946, pp. 61 +, illus.* 2).—Estimates are included for different grains, hay, different seeds, potatoes, fruits and nuts, beans, broomcorn, buckwheat, cowpeas, flaxseed, hops, maple products, peas, peanuts, popcorn, rice, sorgo and sugarcane sirups, soybeans, sweet potatoes, and velvetbeans. Cotton, cottonseed, tobacco, sugar beets, and sugarcane are not included.

Cash receipts from farming by States and commodities, calendar years 1924-44 (*U. S. Dept. Agr., Bur. Agr. Econ., 1946, pp. 183 +, illus.* 12).—Tables present State estimates of cash receipts from crops and livestock by commodities for the calendar years 1924-44, of government payments for the calendar years 1933-44, and of the value of crops and livestock and livestock products consumed by families on farms where produced, 1924-44.

Commodity futures statistics, July 1944-June 1945 (*U. S. Dept. Agr., Prod. and Market. Admin., 1946, CS-17, pp. 36 +*).—This is a continuation of the series (E. S. R., 93, p. 89) representing data on the volume of trading, open contracts, future prices, contracts settled by delivery, and trades and commitments of reporting traders in commodities covered by the Commodity Exchange Act. "The statistics are compiled from reports required of exchange clearing members and large traders by regulations promulgated under the act, and from official price records of contract markets."

Crops and Markets [April 1946] (*U. S. Dept. Agr., Crops and Markets, 23 (1946), No. 2, pp. 73-108*).—Included are tables of the usual types covering farm employment and wage rates; prices received and paid by farmers, etc.; crop, livestock, and market reports of the usual types; crop production, 1933-45; crop yields, 1929-45; indicated yield or condition of selected crops; planted and harvested acreages, 1931-46; and prospective plantings, March 1946.

RURAL SOCIOLOGY

Minnesota's farm population prospects, L. NELSON (*Minnesota Sta., [1945], pp. 24+, illus. 8*).—The author concludes that after the war the farm population of Minnesota may be expected to rise somewhat above the low level to which it has declined during wartime, the amount of increase depending almost entirely upon the state of industrial activity outside of agriculture. The farm population for the past 20 yr. has been fluctuating around 900,000. In good times it has gone below and in bad times above that point by several thousand. If it rises above 900,000 it would indicate a rather serious industrial depression, which will be reflected in falling agricultural prices. In reasonably good times, we should expect it to be considerably below that figure. It is estimated that some 6,000 vacancies take place annually in the labor force, so that about 3,000 of the more than 9,000 boys who reach the age of 18 each year on Minnesota farms would need to move to the cities. Prospective developments call for careful planning in advance if unfortunate land settlement is not to recur. As regards acreage in operated farms, the trend has been opposite to that for the population, and there is larger acreage in fewer farms operated by fewer people. The over-all trend in the population of the United States and of Minnesota is towards a "leveling-off" in the total number of people.

"Johnny didn't pass this year"—rural schools face a major problem, S. C. MAYO (*Res. and Farming [North Carolina Sta.], 4 (1946), Prog. Rpt. 2, pp. 5, 6, illus. 2*).—In 1940, out of 640,907 boys and girls 8 through 16 yr. of age attending school in North Carolina, 212,044 were retarded one or more grades. Retardation is an especially serious problem in rural areas and especially among rural-farm youths, involving some 38.2 percent of the rural-farm children 8 through 16 yr. of age (43.9 percent of the boys and 32.5 percent of the girls) and more than half of the rural-farm boys 12, 13, 14, and 15 yr. of age. A larger proportion of boys than girls were retarded in all three residence classes—urban, rural-farm, and rural-nonfarm—and in all ages of each group. The problem is particularly severe among Negroes, (51.1 percent of all Negro youths 8 through 16 yr. of age in the State retarded as compared with 25.6 percent of the white boys and girls), and including 63.4 percent of the rural-farm Negro boys.

Washington high school graduates in depression and in war years, P. H. LANDIS (*Washington Sta. Bul. 463 (1945), pp. 20, illus. 12*).—In Washington, more girls than boys have attended high school since the earliest period of this study, 1934 (E. S. R., 88, p. 542.). The ratio of boys to girls began to drop further during the first year of the war, and the third war-year class was 25 boys per hundred women short. The proportion of Washington boys entering the armed forces immediately after high school graduation increased from 5.2 percent in 1942 to 43.3 percent in 1944, but the proportion entering the work world decreased during this period.

Although the number of Washington girls in college increased a great deal during the third war year over previous periods, the total number continuing their education in all kinds of schools was less in 1944 than during the depression and prewar period. Of the 1944 class, 5.9 percent entered schools of nursing, the highest percentage for the period. Commercial schools had almost a third less registrants from the 1944 class than from the prewar classes.

Store and office work prior to the war offered an outlet for 44 percent of the boys, but during 1944 only 1.2 percent entered this kind of work. Fac-

tory work and trades also drew a smaller percentage of the 1944 class. Few girls and rural boys continued in high school as postgraduates after graduation; 6.8 percent of the rural boys went on to college. This was a slightly higher proportion than of the class of 1943.

Of the boys a majority entered the armed forces immediately after high school graduation in 1944. Fewer girls were in the labor market than of the preceding war period graduating classes, but almost twice as many found work as in the prewar period. Rural boys apparently were not to any great extent using agriculture as a way of avoiding service in the armed forces. A much higher proportion of youth from metropolitan and larger cities continue their school beyond high school than of rural youth. A somewhat higher proportion of young women from urban than from rural areas also continue their training beyond high school, although the differences are not so great as for young men.

Rural social trends in New York: Their implications for extension activities. W. A. ANDERSON (*N. Y. State Col. Agr., Cornell [Ext.] Misc. Bul. 2 (1946), pp. 11 +*).—Social trends in New York State have resulted in rapid increases in the rural population, particularly in the rural-nonfarm inhabitants of the State. These changes result from the revolutions in transportation, and communication, the mechanization of farming and the rural home, and major developments in three social institutions, namely the school, co-operatives, and government. The process of creating cultural unification has significant implications for extension activities. Paramount among these is the problem of rural-community organization. These new changes, with new populations and new social class structures, may develop sharp segregations in rural communities or they may be guided into constructive community living. The increased mechanization of farming demands keen management and technical ability that calls for more education. The differences between farm owners and farm laborers may be sharpened. Farm laborers constitute one-third of the persons employed in New York agriculture. Part-time and subsistence farmers are significant in the new rural life. Rural-family participation in organizations is largely passive, and the active participants are chiefly from the larger income families. This means that extension organizations are socially selective and the younger families and those on poor lands are not active. The rural church must evolve a constructive centralization. Schools, taxes, and questions of local government present problems that extension can help to solve. Rural areas were, only three decades ago, almost completely organized on an intimate, face-to-face basis. Today a new impersonal rural life will be evolved unless extension agencies, by a program of constructive community activities, help to integrate these new, diverse groups and interests.

Virginia's people: A cultural panorama. J. B. GITTLER (*[Richmond]: Va. State Planning Bd., 1944, pp. 125, illus. 38*).—This is a special report in which the author reviews the economic and cultural development of the people in the State of Virginia.

AGRICULTURAL AND HOME ECONOMICS EDUCATION

George Washington Curtis and Frank Arthur Gulley: Two Early Agricultural Teachers in Texas. S. W. GEISER (*Field and Lab., 14 (1946), No. 1, pp. 13, illus. 2*).—Biographical accounts are given of these pioneers (E. S. R., 80, p. 287; 93, p. 816), in agricultural education and research.

FOODS—HUMAN NUTRITION

Index to the literature of food investigation, A. E. GLENNIE and J. L. H. KEUNEMAN ([*Gt. Brit.*] *Dept. Sci. and Indus. Res., Index Lit. Food Invest.*, 16 (1944), No. 1, pp. 74+).—This annotated bibliography to food investigations, classified by subject, continues the series previously noted (E. S. R., 94, p. 677). The literature covered in this issue is chiefly for the period 1941-43 and deals with the following general topics: Meat; pig flesh; poultry and game; fish; eggs; dairy produce; fats and oils; fruit and vegetables; grain products, crops and seeds; theory of canning; theory of freezing and chilling; bacteriology; mycology; engineering; and miscellaneous items.

Tables of representative values of foods commonly used in tropical countries, B. S. PLATT ([*Gt. Brit.*] *Med. Res. Council, Spec. Rpt. Ser.*, No. 253 (1945), pp. 41).—This compilation presents data on the proximate mineral and vitamin content per 100 gm. edible portion of 233 foods, grouped into 12 main categories on the basis of their nutritive value and with consideration to the type of dietary commonly found in tropical countries: (1) Cereals and starchy roots, fruits, etc.; (2) legumes; (3) oilseeds and nuts; (4) vegetables—leafy, green, yellow, and other; (5) fungi and yeasts; (6) fruits; (7) stems; (8) fats and oils; (9) animal products—fish and fish products including Mollusca and Crustacea, insects, meat, meat products, eggs, milk, and milk products (10) condiments and spices; (11) sirups, sugars, and preserves; and (12) beverages. Foods are designated by common English and botanical names, with supplementary information in certain cases on alternative botanical names and native names. Data on Ca and Fe, among the minerals, and vitamin A, thiamine riboflavin, nicotinic acid, and ascorbic acid among the vitamins, are tabulated insofar as figures were available. Calories per 100 gm. edible portion and waste as percentages on the as-purchased basis are also given.

The tables are based on values selected from an extensive literature noted in the bibliography and on unpublished data obtained from analyses of samples collected by the Nyasaland nutrition survey, which is briefly discussed. "An attempt has been made to assess the weight to be attached to the various analyses, and to arrive at representative values for a suitable range of foodstuffs. These values are considered to be sufficiently well founded for the purpose for which they have been compiled, namely, the evaluation of dietary data based on records of group intake. They are not suitable for surveys by the individual method, nor for precise nutritional investigations on individual human and animal subjects. Many of the values are at present only tentative or provisional, and revision will be undertaken from time to time as further data become available."

Facts and recipes for corn meal and grits (*Clemson Agr. Col., S. C., Ext. Cir.* 275 (1946), pp. 20, illus. 3).—This circular combines the material previously presented (E. S. R., 93, p. 509; 94, p. 532).

Fruit granules, W. V. CRUESS, H. F. FRIAR, and T. SHEARING (*Canner*, 102 (1946), No. 16, p. 12).—When mixed with three parts (by weight) of anhydrous dextrose, screened and air-dried, concentrated orange juice of 70°-72° Balling yields a dry, granular product which may be used for candy, additions to dry breakfast cereal, or used in milk shakes, gelatin desserts, cooky and cake batter, and fruit punches.

The nutritive value of canned foods.—VIII, Distribution of proximate and mineral nutrients in the drained and liquid portions of canned vegetables,

A. KRAMER. (Md. Expt. Sta.). (*Jour. Amer. Dietet. Assoc.*, 21 (1945), No. 6, pp. 354-356).—This study forms part of a cooperative project on the nutritive value of canned food (E. S. R., 94, pp. 395-398). Asparagus, green beans, lima beans, beets, carrots, corn, peas, and spinach were analyzed for their proximate and mineral (Ca, P, and Fe) composition. Results varied widely not only among the products but among samples of the same product.

The following generalizations were noted: "The liquid portion rarely exceeds one third of the entire can contents. . . . Any specific nutrient was rarely present in the liquid portion to a greater extent than one-third of its total content in the can. Nutrients insoluble in water remained principally in the solid portions of the foods."

A discussion is presented of the various factors which might be responsible for the results obtained.

Frozen fruits in bulk packages for home use, L. W. ANDERSON and J. D. WINTER (*Minn. Farm and Home Sci. [Minnesota Sta.]*, 3 (1946), No. 3, pp. 2-3, 5, illus. 2).—Commercially frozen blueberries, sweet cherries, apricots and peaches, packed in 20 to 35 lb. containers were repacked into heavily waxed pint containers and placed in home freezer units. Repacking was started when the ice crystals between the fruit defrosted enough for individual pieces to be separated from the original pack, thus eliminating loss of quality in the fruit. Because of the percentage of defects found in the commercially packed fruit, the frozen peaches and apricots were found unsatisfactory for repacking and canning. Blueberries and cherries were found more desirable and convenient to repack. Some of the advantages in using these frozen fruits are noted.

Foods from the freezer precooked or prepared, F. FENTON and J. DARFLER (*N. Y. State Col. Agr., Cornell Ext. Bul.* 692 (1946), pp. 100, illus. 20).—The studies incorporated in this publication are one of a series being carried out under the direction of the committee on Frozen Food Research (made up of staff members at Cornell University). The term cooked or precooked is used here to include some foods such as salads, batters, doughs, pies, cookies, biscuits, and rolls which are frozen, prepared, uncooked foods. Foods which are strictly fresh only at certain times of the year, dishes that require long preparation and little more work when prepared in quantity, and dishes that require only slight thawing are good foods for freezing if desired lengths of storage are observed. General information is given regarding preparation (including recipes), packaging, storage temperatures, length of storage, and preparation for the table.

Improvement in the method of cooking certain dehydrated foods, J. R. SPINELLA, C. E. FRENCH, and G. H. BERRYMAN (*Jour. Amer. Dietet. Assoc.*, 21 (1945), No. 3, pp. 148-150).—Studies were made on the following dehydrated foods: Apple nuggets, beets, cabbage, carrots, cranberries, onions, potatoes, sweetpotatoes, and turnips. Reduced ascorbic acid was determined by the method of Loeffler and Ponting (E. S. R., 89, p. 515) and total ascorbic acid by the method of Roe and Kuether (E. S. R., 90, p. 297). Assays were made on the product uncooked, after cooking without preliminary hydration, and after following the recommended procedures of soaking and cooking.

The results are evaluated in terms of palatability, length of preparation time, yield of product, and ascorbic acid content. In general, the one-step method (without hydration) gave superior results including better appearance, texture, and palatability; considerable shortening in the time of preparation; and better retention of ascorbic acid.

With the exceptions of beets and cranberries, which gave a 10 to 20 per cent lower yield of the cooked drained product by the one-step method, the yields for the other dehydrated foods were comparable in both methods of cooking.

Food consumption levels in the United States, Canada, and the United Kingdom, K. JACOBSON, J. N. LEWIS, I. S. MCARTHUR, L. B. PETT, P. G. H. BARTER, and W. D. S. JONES (*U. S. Dept. Agr., Prod. and Market. Admin., 1946, pp. 58 +, illus. 7*).—This third report to the Combined Food Board on food consumption levels in the United States, Canada, and the United Kingdom is a revision of statistical material included in the second report (E. S. R., 92, p. 859). The changes between 1944 and 1945 are reviewed, and comparisons are given for civilian supplies before the war and during war years. Special attention is given to the recapitulation of the three countries from the prewar period, 1935-39, up to 1945. The per capita food supplies are shown in tabular form, and include commodities as well as nutrients.

The impact of the war on civilian consumption in the United Kingdom, the United States, and Canada, M. A. COPELAND, E. ROSS, J. F. PARKINSON, R. W. JAMES, H. CAMPION, and R. G. D. ALLEN (*Washington 25, D. C.: Govt., 1945, pp. 157 +*).—This is a report to the Combined Production and Resources Board from a special Combined Committee on Nonfood Consumption Levels. Objective measurements affording a basis for comparisons between these countries are proposed. Pertaining to the physical volume of goods and services obtained by civilians, a portion of this study is devoted to the restrictions and alterations of the character of consumption. Analyses are made in detail on the extent to which consumption of different items has been changed as a result of the war.

Nutritional status of midwestern college women, E. G. DONELSON, P. M. NELSON, M. A. OHLSON, M. S. PITTMAN, R. M. LEVERTON, H. MCKAY, G. M. KINSMAN, W. ARMSTRONG, and M. S. REYNOLDS. (Minn., Iowa, Kans., Nebr., Ohio, Okla., and Wis. Expt. Stas.). (*Jour. Amer. Dietet. Assoc., 21, (1945), No. 3, pp. 145-147*).—Nutritional status studies covering a 6-yr. period (1936-42) were carried out as a joint project in seven Midwestern States. Identical methods and procedures were followed at all cooperating institutions. Separate parts of the study have been published periodically (E. S. R., 93, p. 95), and the general results obtained in the various studies are here tabulated and discussed.

The data show that the mean values for height and weight are 163.7 cm. and 57.1 kg., respectively. Basal metabolism results vary with locality (climate). In Kansas and Oklahoma, with a warmer climate, the values were somewhat lower than in the other States (33.0-33.1 v. 34.1-34.9 calories per square meter per hour). All values were lower than the theoretical standards for young women (36.9-37.4 calories per square meter per hour). Average values for blood constituents were found to be: Hemoglobin 13.4 gm. per 100 cc.; red cell count 4.56 millions per cubic millimeter; hematocrit 40.9 percent; and plasma ascorbic acid 0.66 mg. per 100 cc.

A qualitative assessment of the diets revealed a notable lack in the amount of citrus fruits and tomatoes used, and an inadequate intake of green and yellow vegetables, and milk. Although the number of students eating whole grain products was low, it was anticipated that the bread enrichment program would have offset this to a degree.

"The mean calorie value of the self-selective, weighed diets of a group of 58 women was approximately 2,000 calories per capita. From the metabolic balance studies performed, the authors conclude that 1 gm. calcium daily

might well be recommended at ages 17 to 24 yr. and that 1 gm. phosphorus and 56 gm. protein are necessary to maintain equilibrium. In the case of iron, it was found that the adequacy of the remainder of the diet is of signal importance and that with a good diet an intake of only 7.21 mg. iron daily is sufficient."

School lunches: A list of references, C. L. FELDKAMP and M. K. SILVER (*U. S. Dept. Agr., Libr. List 26 (1946), pp. 66*).—This extensive annotated bibliography with index contains 528 selected references on the subject of school feeding in the United States during the years 1925 through 1945. It includes references on lunchroom management, the use of the school lunch as a means of training and education, nutrition aspects, lunch programs, and the preparation, serving, and popularizing of balanced lunches. References on the home-prepared lunch have been omitted, as have references on the nutrition of school children unless they deal with school feeding. Sources consulted are noted, and such references cited as are available carry the call numbers of the U. S. D. A. Library.

Some effects of a white corn meal shortage, D. DICKINS. (Miss. Expt. Sta.). (*Jour. Amer. Dietet. Assoc., 21 (1945), No. 5, pp. 287-288*).—Data were obtained from questionnaires filled out by 1,404 white and Negro children in 12 junior high schools in Mississippi as to the influence of a shortage of white corn meal upon the food habits of the groups studied. Tabulated results indicate the relative consumption of 18 foods when accompanied by white corn bread, yellow corn bread, or biscuit. In the absence of white corn meal, a large proportion of the families questioned either made no corn bread (8-12 percent) or made corn bread only a few times with yellow corn meal (43-61 percent).

The consumption of buttermilk and the strong-flavored, green leafy vegetables, such as turnip greens, collards, and cabbage was greatly reduced when the use of corn bread was limited by the shortage of the white corn meal (which was preferred by over 61 percent of those questioned).

The author stresses the point that the superior nutritive value of yellow corn meal over white corn meal may be offset by the fixed food habits of the population. Reduced consumption of other foods (greens and buttermilk) occurs when the quantity of the favorite kind of corn bread is limited.

Observations on the growth-stimulating action of certain proteins added to protein-free diets compounded with amino acids, D. W. WOOLLEY (*Jour. Biol. Chem., 159 (1945), No. 3, pp. 753-754*).—Mice fed acid-hydrolyzed casein (18 percent) as the source of N in their diet grew at a suboptimal rate even when cystine and tryptophan were added to the diet. Small amounts of intact casein or crystalline trypsinogen were necessary for the restoration of normal growth. Coagulated egg white was ineffective.

Streptogenin (an unidentified peptide-like bacterial growth factor) was prepared from a tryptic digest of casein and fed at a level equivalent to the minimal effective dose of intact casein. At this level (equivalent to 2 percent casein), normal growth was restored. The activity of the streptogenin was destroyed by acid hydrolysis.

The author stresses the point that "for mice, as well as for bacteria, the nutritional properties of proteins are not related solely to the amino acids obtainable by acid hydrolysis."

Nutritional value of yeast protein to the rat and the chick, A. A. KLOSE and H. L. FEVOLD. (U. S. D. A.). (*Jour. Nutr., 29 (1945), No. 6, pp. 421-430*).—Brewers' yeast and torula yeast grown on molasses were fed to

rats as the protein supplement to an adequate basal diet. The same yeasts, as well as a torula yeast grown on prune juice, were tested on chicks.

Previous experiments (E. S. R., 93, p. 97) on the nutritive value of yeast protein for rats were confirmed; similar results were observed with chicks.

The experiments demonstrated that, at the levels fed, yeast protein produced growth inferior to that produced by equivalent amounts of casein. With rats, the level of crude protein was approximately 13.3 percent (based on the factor $N \times 6.25$). The addition of 0.5 percent methionine to the yeast diet of rats or chicks increased the growth rate so that it became comparable to that obtained with casein. The inclusion of 0.5 percent of *l*-cystine further increased the efficiency of the yeast diet.

No toxic effects were noted when yeasts were fed at relatively high levels (approximately 40 percent of the diet) over a limited period of time.

The authors conclude that the inadequacies of yeast protein can be corrected by the addition of methionine or methionine-rich protein to the diet.

The relation between absorbed nitrogen, nitrogen balance, and biological value of proteins in adult dogs, J. B. ALLISON and J. A. ANDERSON. (Rutgers Univ.). (*Jour. Nutr.*, 29 (1945), No. 6, pp. 413-420, illus. 2).—Based on nitrogen equilibrium studies made on normal adult dogs, formulas are presented showing the relationship between nitrogen balance (NB), absorbed nitrogen (AN), urinary nitrogen (UN), and biological value (BV).

The relationship between NB and AN was found to be linear in the region of negative NB, becoming obviously curvilinear well on the positive side of NB.

The biological value (BV) of the protein of the foods tested was found to be casein = 0.82, chicken entrails = 0.77, flounder entrails = 0.77, flounder heads = 0.52, and a protein derived from soybean = 0.39.

A dietary factor essential for guinea pigs.—VII, Changes in the distribution of the plasma protein during the deficiency, W. J. VAN WAGTENDONK and L. P. ZILL. (Oreg. State Col.). (*Jour. Biol. Chem.*, 159 (1945), No. 2, pp. 247-253).—Guinea pigs fed a diet deficient in the antistiffness factor (E. S. R., 93, pp. 512-514) exhibited significant changes in the distribution of plasma protein. Total plasma nitrogen was raised, primarily due to an increase in globulin nitrogen. Albumin nitrogen was found to decrease. As a result, the albumin-globulin ratio was disturbed, becoming much lower (0.35 to 0.65) in the deficient guinea pigs than in normal ones (normal ratio about 1.00 to 1.18).

The implications of the changes observed are discussed.

The protein requirements of adult human subjects in terms of the protein contained in individual foods and food combinations, M. BRICKER, H. H. MITCHELL, and G. M. KINSMAN. (Univ. Ill.). (*Jour. Nutr.*, 30 (1945), No. 4, pp. 269-283, illus. 1).—Nine college women served as subjects. A basal diet consisting of sugar-cornstarch-lard cookies supplemented with sucrose, lactose, fondant, jelly, butterfat, lemon juice, apple sauce, lettuce, and French dressing furnished from 0.14 to 0.23 gm. of nitrogen daily. Supplements of minerals and vitamins were added. Test foods, fed in amounts needed to maintain body weight, were able to supply 91 percent or more of the total N ingested.

The protein foods tested were soya flour, patent white flour, milk, a soya-white flour mixture containing 13 percent soya flour, and a well-balanced mixture of normally consumed foods (oatmeal, egg, milk, beef, potatoes, biscuits, etc.). "All test foods . . . were cooked in some appropriate manner if they are commonly prepared by cooking." Each food was studied at

several levels of N intake to determine the relationship existing between N intake and N balance.

"For milk, white flour, soya flour, the soya-white flour combination, and the mixed foods, the indicated biological values were, respectively, 74, 41, 65, 55 and 65 percent, and the amounts of nitrogen required for equilibrium (as ordinarily measured) were, respectively 2.76, 4.76, 2.88, 3.38, and 3.12 mg. per basal calorie." True digestibility for the same foods was calculated to be 94, 97, 92, 94, and 90 percent, respectively.

One subject, on the white flour diet, was found to be in negative N balance. Supplementation with small amounts of lysine produced a positive N balance, indicating the need of this amino acid by the adult human for nitrogen equilibrium.

The utilization of d-amino acids by man, III-IV (*Jour. Biol. Chem.*, 160 (1945), No. 1, pp. 25-34, illus. 2).—A continuation of the series (E. S. R., 95, p. 128).

III. *Arginine*, A. A. Albanese, V. Irby, and J. E. Frankston (pp. 25-30).—Studies were made of the output of N metabolites, urea, amino N, and arginine in particular, following the administration of equal quantities of *l*(+)- and *dl*-arginine. Results indicate that the *d* form is catabolized in the human. Experimental support arises from the *in vitro* finding that crude arginase prepared from human liver yields stoichiometric equivalents of urea from both *d*(-)- and *l*(+)-arginine. Experiments with rat liver preparations showed a lack of arginase activity with respect to *d*(-)-arginine.

IV. *Acetyltryptophane*, A. A. Albanese, J. E. Frankston, and V. Irby (pp. 31-34).—Studies on human metabolism showed that the urinary excretion of the *d* component of acetyl-*dl*-tryptophan, unlike that of *dl*-tryptophan, does not differ qualitatively from that of the *l* component. Measurements of the urinary output of indole metabolites following the administration of acetyl-*l*(-)- and acetyl-*dl*-tryptophan indicated greater utilization of acetyl-*d*-tryptophan in man than of *d*-tryptophan. The significance of these observations to human nutrition is discussed.

A study of hemoglobin formation following the administration of certain amino acids to rats fed a diet low in protein, A. U. and J. M. ORTEN (*Jour. Nutr.*, 30 (1945), No. 2, pp. 137-142).—Weanling female rats were fed a low-protein diet (lactalbumin 3.5 percent) which was found to produce a chronic anemia. Supplements with 15 individual amino acids in amounts comparable to that found in 18 percent lactalbumin produced no consistent increase on the hemoglobin content of the blood of the rats. Controls on the initial 3.5 percent protein level showed normal hemoglobin values after 6 weeks supplementation with adequate amounts of lactalbumin.

The authors interpret the results "as evidence that no single amino acid can be regarded as a 'key' amino acid in hemoglobin synthesis in the organism, but rather that a combination of amino acids in as yet undetermined proportions is essential for the *in vivo* fabrication of the hemoglobin molecule."

Tryptophane utilization and synthesis by strains of *Lactobacillus arabinosus*, L. D. WRIGHT and H. R. SKEGGS (*Jour. Biol. Chem.*, 159 (1945), No. 3, pp. 611-616, illus. 4).—By the use of daily transplants in media low or lacking in tryptophan, strains of *L. arabinosus* were developed which grew abundantly without the addition of tryptophan, indole, or anthranilic acid. When grown in the presence of tryptophan, the altered strain produced tryptophan in an amount inversely proportional to that added to the media.

The authors stress the fact that the nutritional requirements of micro-organisms may be influenced appreciably by differences in the methods of handling.

The effects of the dietary supply of carbohydrate upon the response of the human respiratory quotient after glucose administration, H. F. ROOT and T. M. CARPENTER (*Jour. Nutr.*, 30 (1945), No. 5, pp. 333-341).—For periods lasting several days, two medical students were fed diets containing 350, 75, or approximately 11 mg. of carbohydrate per day. Basal respiratory quotient (R. Q.) was measured on alternate days and, after the ingestion of 50 mg. glucose, the R. Q.'s were determined at 15-min. intervals over a 3-hr. period.

Calculated by the usual empirical formula, the basal combustion of carbohydrate (estimated to 3 hr.) averaged 12.0 and 13.4, 6.1 and 7.1, 0 and 2.1 gm. for subjects A and B on the three dietary levels, respectively. Similarly, the increase in combustion of carbohydrate after ingestion of 50 gm. of glucose was 14.0 and 8.7 at the 350-gm. level, 8.7 and 5.9 at the intermediate level, and 7.9 and 4.8 gm. at the low level of dietary carbohydrate.

The authors conclude from their observations that "the level of carbohydrates in the preceding diet affected the basal combustion of carbohydrates noticeably, and to some extent the increases in carbohydrate combustion after ingestion of glucose, but not so much as one would expect when the demand for replacement of glycogen supply is considered."

The effect of various adjuvants to the diet of rats on the changes in body fats induced by feeding soybean oil, J. A. SCHULZ and B. H. THOMAS (*Iowa Sta. Res. Bul.* 336 (1945), pp. 625-647).—Fourteen lots of six rats each were fed a basal ration composed of 50 percent solvent process soybean oil meal, 2 percent yeast, 1.5 percent salts, 10 percent soybean oil, codliver oil concentrate, and sugar to make a total of 100 percent. Thirteen adjuvants affecting the fat metabolism were added to the diet. Of these carotene, bile salts, agar-agar, sodium flouride, and calcium chloride probably induced the deposition of fats with lower iodine values.

In a second experiment, six lots of seven rats each were fed approximately the same diet as noted above except that starch replaced the sugar. Three levels of carotene or 1 percent levels of choline chloride or nicotinic acid were added to this diet as supplements. There was no evidence from the results obtained that these supplements influenced consistently the hardness of the deposited body fat.

The dietary production of fatty livers resistant to the action of choline, M. L. MACFARLAND and E. W. MCHENRY (*Jour. Biol. Chem.*, 159 (1945), No. 3, pp. 605-609).—Previous studies by Gavin and McHenry on the effect of B vitamins on fat metabolism (*E. S. R.*, 88, p. 555) have been elaborated. Rats were depleted of fat by being fed a fat-free, B vitamin-free basal diet for 3 weeks. Supplements of certain B vitamins, when fed with a beef-liver fraction (1), or with biotin (2), caused the production of fatty livers and an increase in the cholesterol content of the liver. The addition of choline to the diet had no effect on the fatty livers produced by (1), but markedly reduced the fatty acid content of the fatty livers induced by (2). The addition of inositol to the diet was effective in reducing liver fat to a low level in (1) with or without the addition of choline to the diet. In biotin-induced fatty livers, inositol alone was partially active and, with the addition of choline, completely effective in preventing the formation of fatty livers.

The effect of cocoa on the utilization of dietary calcium, H. H. MITCHELL and J. M. SMITH. (Univ. Ill.). (*Jour. Amer. Med. Assoc.*, 129 (1945), No. 13, pp. 871-873).—"In the growing rat, two medium cost cocoas containing about 22 percent of fat depressed the utilization of calcium in proportion

to their content of oxalic acid. A low cost cocoa containing about 11 percent fat and apparently appreciably more cacao shell depressed growth more than the higher grade cocoas, and depressed calcium retention about twice as much as can be accounted for by its content of oxalic acid.

"In adult human subjects, whether subsisting on a low calcium diet or on diets of borderline calcium adequacy, a medium cost cocoa in daily portions of 21 to 38 gm., approximating the tolerance limit, was not shown to affect the calcium balance adversely.

"However, if the effect of such cocoas on calcium utilization resides entirely in their content of oxalic acid, as the rat experiments indicate, it would not be expected to be appreciable in human metabolism, because the oxalic acid content of cocoa is only moderate, i. e., 0.5 to 0.6 percent, and the calcium in the cocoa itself is sufficient to combine with about two-thirds of the oxalic acid. Furthermore, the immobilization of milk calcium in the digestive tract by the remaining third of the oxalic acid of cocoa, equivalent to 22 mg. of calcium for a 1-oz. portion of cocoa, would be expected to depress calcium retention by only one-fifth of this amount (4 or 5 mg. of calcium), because of the poor utilization of calcium (19 percent or so) by the adult human organism. Such a small depression in calcium retention is practically impossible to detect by the technic of the metabolism experiment with human subjects. . . ."

Calcium metabolism of preschool children, E. K. WATSON, E. W. MCQUIRE, F. L. MEYER, and M. L. HATHAWAY. (Cornell Univ.). (*Jour. Nutr.* 30 (1945), No. 4, pp. 259-268).—The present data form part of a comprehensive study on the influence of variation in the ascorbic acid and citrate content of the diet upon the ascorbic acid, citric acid, Ca, P, and N metabolism of eight preschool children (E. S. R., 95, p. 129).

Calcium intake averaged 1,122 mg. per day for half of the subjects and 775 mg. per day for the remainder. Basal diets were supplemented with ascorbic acid, potassium citrate, or orange juice.

Results, tabulated in detail, indicate that calcium retentions (during 16 weeks' test) averaged 131 ± 50 mg. on the higher level and 96 ± 25 mg. on the lower level of intake. Addition of ascorbic acid or orange juice to the basal diet produced no significant increase or change in the calcium retention. The addition of 3.38 gm. of potassium citrate lowered the urinary excretion of calcium in all eight subjects but did not alter the level of calcium retention.

As the absorption of calcium did not seem to be in the main factor regulating its retention in at least five of the children tested, it is concluded that "factors other than diet alone regulated the calcium retention during the 16 weeks of observation."

The availability of the iron in Hawaiian-grown vegetables, C. D. MILLER and L. LOUIS. (Hawaii Expt. Sta.). (*Jour. Nutr.*, 30 (1945), No. 6, pp. 485-494, illus. 1).—The iron content of 15 vegetables and 2 seaweeds grown in Hawaii was determined by the chemical method with ortho-phenanthroline using a photoelectric colorimeter. The availability of the iron was determined by its ability to regenerate hemoglobin in anemic rats. Comparisons were made with control groups fed pure ferric chloride. Supplements of Cu and Mn were fed to all the animals.

Considering the utilization of the iron in FeCl_3 as 100, the availability of the iron from the various foods was as follows: "Green soybeans 96, taro corms 93, taro leaves 93, fresh lima beans 74, cowpeas (pods) 65, a seaweed, limu lipoa (*Haliseris plagiogramma*) 62, swamp cabbage (*Ipomoea aquatica*)

59, broccoli 52, green snap beans 49, white mustard cabbage (*Brassica chinensis*) 34, amaranth (*Amaranthus gangeticus*) 32, watercress 31, belembe (*Xathosoma brasiliense*) 31, carrots 17, green mustard cabbage (*Brassica juncea*) 10, and asparagus 6."

"The superior quality of the iron of legume seeds for hemoglobin regeneration in the rat was confirmed. Taro corms and taro leaves, both important items in the diet of the Polynesians, were shown to have a high percentage of available iron.

"The percentage of the food iron soluble in dilute acetic or in dilute sulphuric acid bore no relationship to the availability as determined by bioassay."

Comparative effectiveness of various iron compounds in promoting iron retention and hemoglobin regeneration by anemic rats, S. FREEMAN and M. W. BURRILL (*Jour. Nutr.*, 30 (1945), No. 4, pp. 293-300).—Anemic rats were fed various compounds of iron as iron salts or in bread. No differences in qualitative or quantitative retention were found due to the method of feeding.

The effectiveness of the various iron compounds with respect to the relative degree of iron retention and hemoglobin regeneration in anemic rats was as follows: Ferric chloride > sodium ferric orthophosphate = ferric phosphate > reduced iron > sodium iron pyrophosphate.

Anemia was prevented in milk-fed rats by feeding supplements of ferric chloride or sodium iron pyrophosphate for 40 days after weaning. Iron retention and hemoglobin regeneration in these animals were comparable to results obtained with depleted (anemic) rats fed the same supplements for 28 days.

The availability of soybean oil meal phosphorus for the rat, R. R. SPITZER and P. H. PHILLIPS. (*Wis. Expt. Sta.*). (*Jour. Nutr.*, 30 (1945), No. 2, pp. 117-126, illus. 2).—Weanling rats were fed a semi-synthetic diet containing 14 percent fibrin and a low-calcium low-phosphorus salt mixture as a basal ration. The ration furnished 0.28 percent phosphorus and was supplemented with either CaHPO_4 or CaCO_3 to provide approximately 0.6 percent calcium. Additions of various amounts of inorganic phosphorus (up to 0.3 percent) were made in connection with the basal diet. Substitution of the 14 percent fibrin with equivalent amounts of casein (14 percent) or soybean oil meal in amounts to provide 14 percent protein was also made.

Results showed that the blood fibrin ration used was an excellent low phosphorus ration, as adequate growth and bone formation occurred in young rats when proper supplements of phosphorus were added. Soybean oil meals prepared by the expeller or solvent process were found to contain 0.66 percent P, of which 58 percent was in the form of phytin or phytic acid. Results showed that the phosphorus of soybean oil meal was readily available for growth and bone formation. Additional heat apparently had no measurable effect on the availability of the phosphorus. The phosphorus of casein was also readily available. Regardless of the level of phosphorus ingested the bone ash contained approximately 18 percent phosphorus.

The protein of soybean oil was practically equal to that of blood fibrin, and both of these proteins proved superior to casein when used at the 14 percent level.

Enzymatic relationships in the utilization of soybean oil meal phosphorus by the rat, R. R. SPITZER and P. H. PHILLIPS. (*Wis. Expt. Sta.*). (*Jour. Nutr.*, 30 (1945), No. 3, pp. 183-192, illus. 2).—In continuation of the study

noted above, weanling rats were fed a similar diet with the exception that a 1 per cent 1 : 20 liver powder was omitted.

In certain experiments, the entire ration, or the soybean oil meal fraction, was heated at 98° C. for 48 hr. in an attempt to destroy any possible phytase present. Neither the removal of the liver powder supplement nor the use of heat-treated rations affected the availability of the phosphorus present. The utilization of soybean oil meal P was considered to be independent of any ration-borne heat-labile phytase.

A method was devised for the estimation of phytase activity and used to analyze samples of rat, chicken, pig, and cow intestines. Results showed that the small intestinal mucosa and the intestinal contents of the rat possessed phytase activity, as did the intestinal mucosa of the other species studied. The optimum pH for the enzyme was 7.8. Soybean oil meal showed no phytase activity at either pH 5.2 or 7.8.

The authors conclude that "from these studies it would appear that the phytin or phytic acid phosphorus of soybean oil meal was made available by the action of intestinal phytases."

Vitamin A and carotene in the nutrition of the guinea pig, L. S. BENTLEY and A. F. MORGAN. (Univ. Calif.). (*Jour. Nutr.*, 30 (1945), No. 3, pp. 159-168, illus. 1).—Guinea pigs were maintained on a semi-purified diet composed as follows: Casein 25, cornstarch 40, hydrogenated cottonseed oil 3.5, salt mixture 4, K_2CO_3 0.5, wheat germ 10, yeast 10, and bran 7. This was supplemented three times a week with 6 cc. lemon juice (containing 6 mg. ascorbic acid). With the addition of an adequate amount of carotene or vitamin A, normal growth of young guinea pigs was obtained.

To produce a diet low in vitamin A, the casein was extracted with hot alcohol. In the absence of added vitamin A, this diet produced deficiency symptoms and death within 3-4 weeks. Xerophthalmia and loss of weight were the principal deficiency symptoms noted.

After being fed known amounts of carotene or vitamin A, certain guinea pigs were sacrificed and carcass and tissue analyses made. Results indicated that storage of vitamin A occurred primarily in the liver—traces being found in the kidney. Liver stores were low except when preformed vitamin A was fed. Vitamin A seemed to be approximately six times more effective than carotene in building up liver stores of the vitamin. When sources of vitamin A were removed from the diet, rapid loss of the amount stored in the liver was noted—90 percent disappearing within 30 days.

Preliminary experiments were made to determine the relative importance of carotene and vitamin A upon reproduction in guinea pigs. Results indicated that vitamin A might be superior to carotene in this respect.

Relative value of carotene in vegetables for growth of the white rat, A. R. KEMMERER and G. S. FRAPS. (Tex. Expt. Sta.). (*Arch. Biochem.*, 8 (1945), No. 2, pp. 197-201).—The β -carotene equivalent of 27 samples of raw, cooked, or canned foods or feeds was tested by rat growth in comparison with the β -carotene equivalent of purified carotene in cottonseed oil. The foods studied were alfalfa, apricots, beet greens, carrots, collards, mustard greens, pumpkin, spinach, sweet potatoes, Swiss chard, and turnip greens. With the exception of beet greens and carrots, in which the values were respectively 80 and 64 percent of that of pure carotene, the carotene in the remaining foods was practically as well utilized as the carotene in oil. Average relative values ranged from 94 percent for collards to 109 for alfalfa. However, wide ranges occurred with different samples of the same food (sweetpotatoes ranged from 70 to 116 percent).

The value of 1 γ of pure carotene ranged from 0.8 to 2.4 U. S. P. units (average 1.4) in 20 dried foods or feeds tested. The β -carotene equivalent of these foods was not calculated. The authors conclude from these experiments that "at a low level of feeding, sufficient for moderate growth, the vitamin A value of the β -carotene equivalent in plant materials appears to be equal to that of β -carotene dissolved in cottonseed oil."

Physiological availability to the rat of crude carotene in vegetables, B. L. OSER and D. MELNICK (*Jour. Nutr.*, 30 (1945), No. 5, pp. 385-389).—A number of canned vegetables and fruits were studied in an attempt to correlate crude carotene content, determined colorimetrically, with the vitamin A potency determined biologically.

A photometric adaptation of the A. O. A. C. colorimetric procedure was used; xanthophylls and lycopene being removed by extraction or adsorption. In the rat bioassay technic, mixed tocopherols were fed at a level of 0.5 mg. per day in order to eliminate them as variables in the test.

The canned vegetables tested were carrots, kale, Swiss chard, mixed greens, pumpkin, spinach, squash, tomato products, and vegetable soups. In these products, 1.0 μ g. of crude carotene (free from xanthophyll and lycopene) was equivalent to 1 U. S. P. unit of vitamin A. No great differences were observed in the physiological availability of the carotene in most of the vegetables tested. Prunes, peach puree, and an apricot-apple mixture were also assayed. In the last two products, the bioassay values were three to six times higher than the colorimetric analyses. The authors indicate that in some fruit products the crude carotene content may be a poor index of vitamin A potency. Various reasons for this discrepancy are suggested.

Availability of carotene from kale, E. ORENT-KEILES, E. C. CALLISON, J. SCHAEVITZ, and R. FRENCHMAN. (U. S. D. A.). (*Science*, 103 (1946), No. 2678, pp. 498-499).—Comprehensive experiments were made on 18 lots of steam-cooked kale. The leaf blades were divided in two (excluding midrib or petiole), and half were assayed biologically. The other half were used in preparing extracts which were assayed both biologically and chemically.

"The chlorophylls and xanthophylls were removed by saponification with potassium hydroxide, leaving the carotenoid pigments in the solution. Aliquots were taken from the extract for chromatographing and determining β -carotene spectrophotometrically; the remaining extract was concentrated in cottonseed oil containing hydroquinone and was analyzed biologically."

The biological assays followed the recommended U. S. P. method in which pure β -carotene in cottonseed oil was used as the reference standard.

Results showed the cooked kale to assay 90 International Units per gram by chemical analysis, and 60 I. U. per gram by bioassay. The biological assay value obtained on the extract of cooked kale was 84 I. U. per gram.

The authors suggest that incomplete digestion and consequent incomplete absorption of the vegetable carotene in the digestive tract may be an important factor in differences in the vitamin A values for kale obtained by chemical and biological methods.

Bodily storage of vitamin A in relation to diet and age, studied by the assay method of single feedings, H. L. CAMPBELL, M. UDILJAK, H. YARMOLINSKY, and H. C. SHERMAN (*Jour. Nutr.*, 30 (1945), No. 5, pp. 343-348).—Young rats were fed an adequate diet containing 3, 6, or 12 International Units of vitamin A per gram of air-dry food. The offspring of the original animals, maintained on the same diet, were sacrificed after 30, 60, 90, 150, 225, or 300 days, and the vitamin A content of their livers determined by the single feeding technic.

Results showed that at the lower level of intake (3 I. U. per gram) negligible storage of vitamin A occurred in the liver. With increased intake of vitamin A, larger stores were found both per gram of liver and in total amount stored. At the 12-I. U. level, the body stores increased progressively throughout the range of the experiment. At the 6-I. U. level, a decrease in the rate of storage was noted at about 90 days.

The actual efficiency of storage was found to be about 10 to 30 percent of the theoretically available surplus ingested in the food.

Bodily storage of vitamin A in relation to diet and age studied by means of the antimony trichloride reaction using a photoelectric colorimeter, A. B. CALDWELL, G. MACLEOD, and H. C. SHERMAN (*Jour. Nutr.*, 30 (1945), No. 5, pp. 349-353).—The livers of the animals described above were also assayed for vitamin A by the chemical antimony trichloride method using a photoelectric colorimeter. The results were substantially in agreement with those obtained by the single feeding technic.

The authors note that "at a level of intake of 3 International Units per gram there was very little storage of the vitamin and no increase in storage with increasing age up to 300 days. The vitamin A value of 3 I. U. per gram is not optimal, and in the light of these storage results appears to be near the minimal limit of adequacy."

Retention of B vitamins in oatmeal during cooking, J. M. COOPERMAN and C. A. ELVEHJEM. (Wis. Expt. Sta.). (*Jour. Amer. Dietet. Assoc.*, 21 (1945), No. 3, pp. 155-156).—Regular (large flake) and quick (small flake) oatmeal were cooked for varying lengths of time (2½ min.-2 hr.) in single or double boilers and assayed for four B vitamins. No loss of pantothenic acid, riboflavin, or niacin occurred during cooking, variations of ± 5 percent being considered within the limits of error of the methods of assay.

When the cooking time exceeded 30 min., losses of thiamine were noted. Three methods were used in calculating vitamin loss—(1) by the total change in the amount of vitamin present before and after cooking, based on aliquots of the raw and cooked product and the initial and final weights; (2) by dry weight determinations; and (3) by assaying the vitamin present in a small sample (20 gm.) cooked experimentally. Thiamine losses for quick oatmeal after cooking 30, 60, and 120 min., respectively, amounted to 8, 11, and 14 percent calculated by method 1; 18, 18, and 20 percent by method 2; and 2, 5, and 8 percent by method 3.

The authors conclude that no significant losses occur when oatmeal is cooked 30 min. or less. The total change method (1) is considered best for determining the retention of vitamins during cooking.

Studies on the requirements of the monkey for riboflavin and a new factor found in liver, J. M. COOPERMAN, H. A. WAISMAN, K. B. MCCALL, and C. A. ELVEHJEM. (Wis. Expt. Sta.). (*Jour. Nutr.*, 30 (1945), No. 1, pp. 45-57, illus. 3).—In a continuation of the study of Waisman et al. (*E. S. R.*, 91, p. 772) on the nutritional requirements of the monkey, the methods and technics previously described were used. Riboflavin-deficient monkeys developing a typical hypochromic normocytic anemia did not return to normal when adequate riboflavin was fed. The addition of iron, "pseudopyridoxine," 1 : 20 liver powder, extracted liver residue, and additional casein were also unsuccessful in establishing a normal blood picture or normal growth. Whole liver substance at a level of 3 percent of the ration was necessary for optimum growth and blood regeneration. The factor (or factors) present in whole liver seemed to be labile, and different from the *Lactobacillus casei* factor. Twenty-two references are listed.

Further studies on the monkey anti-anemia factor, J. M. COOPERMAN, K. B. MCCALL, and C. A. ELVEHJEM. (Wis. Expt. Sta.). (*Science*, 102 (1945), No. 2660, pp. 645-646).—Further experiments on the factor described above have shown that fresh beef and pork liver are more potent sources than whole liver powder. Lyophilized liver was as potent as fresh liver, indicating that no destruction was caused by freezing or drying under vacuum.

The effects of light, trauma, riboflavin, and ariboflavinosis on the production of corneal vascularity and on healing of corneal lesions, O. H. LOWRY and O. A. BESSEY (*Jour. Nutr.*, 30 (1945), No. 4, pp. 285-292).—Injury of the cornea was artificially produced in rats which were maintained on diets containing normal, low, or high levels of riboflavin. Corneal trauma was effected by one of three methods: Mechanical, by removal of the epithelium; chemical, by treating with 5 N HNO₃ for 15 sec.; and physical, by exposing to ultraviolet light. The rats were then subdivided into groups which were kept under continuous light or in darkness.

Results showed that brilliant continuous illumination with incandescent lamps did not alter the changes in the cornea and conjunctiva resulting from riboflavin deficiency.

The healing of the injured cornea resulting from ultraviolet light was retarded by brilliant continuous illumination from incandescent lamps and by protracted riboflavin deficiency. Neither visible nor ultraviolet light affected the riboflavin content of the cornea, indicating that this reaction is not the result of local destruction of riboflavin by light but due to some other cause. The healing of injury due to milder trauma (that involving primarily the epithelium) was not affected by either light or riboflavin deficiency alone under the conditions of these experiments. However, a combination of these two factors did lead to definite handicaps.

In a normally nourished rat colony, high riboflavin intake failed to prevent the occurrence of "spontaneous corneal vascularity."

Because of the variety of agents and deficiencies which can induce corneal vascularization, the authors indicate the need for caution in interpretation of corneal vascularization in man.

Alcohol metabolism as related to the production of thiamine deficiency, W. W. WESTERFELD and E. A. DOISY, JR. (*Jour. Nutr.*, 30 (1945), No. 2, pp. 127-136).—Pigeons were fed four different thiamine-deficient diets. Alcohol was used to replace either fat or carbohydrate in calorically equivalent amounts. The diets used were: (1) Low fat (4 gm.), high sucrose (51 gm.), and no alcohol; (2) fat 4 gm., sucrose 34 gm., and alcohol 9 gm.; (3) fat 20 gm., sucrose 15 gm., and no alcohol; and (4) fat 13 gm., sucrose 15 gm., and alcohol 9 gm. On these thiamine-deficient diets, the isocaloric substitution of alcohol for either fat or carbohydrate delayed the onset of acute deficiency symptoms (opisthotonus) and death in pigeons. A discussion presents the possible reasons for this sparing action of alcohol. Twenty-seven references are included.

The excretion of "folic acid" through the skin and in the urine of normal individuals, B. C. JOHNSON, T. S. HAMILTON, and H. H. MITCHELL. (Univ. Ill.). (*Jour. Biol. Chem.*, 159 (1945), No. 2, pp. 425-429).—Excretion studies were carried out for two 5-day periods on four adult male subjects. During the tests, these men lived for 8 hr. per day under hot moist conditions (37.7° C. and 70 percent relative humidity). A constant diet was maintained throughout the experiment, the diet during the second period being supplemented with brewers' yeast containing 5.5 μ of added free folic acid.

Assays of urine and sweat were made by both the *Lactobacillus casei* method (E. S. R., 90, p. 298) and the *Streptococcus lactis* method (E. S. R., 92, p. 760). Results by both methods indicated that under conditions of profuse sweating about five to six times more active folic acid was excreted in sweat than in urine.

The incubation of urine with "vitamin B. conjugase" did not result in the liberation of additional folic acid.

The metabolism of pantothenic acid and its lactone moiety in man, H. P. SARETT. (Oreg. State Col.). (*Jour. Biol. Chem.*, 159 (1945), No. 2, pp. 321-325).—The *Lactobacillus arabinosus* method (E. S. R., 93, p. 536) and the *Acetobacter suboxydans* test (E. S. R., 94, p. 429) were used to assay pantothenic acid and its lactone moiety, respectively. The urinary excretion of these compounds was measured in three normal subjects after normal diets had been eaten and after oral and intravenous administration of pantothenic acid and the lactone or dihydroxy acid moieties.

Normal excretion of pantothenic acid was found to be about 3.5 mg. per day, this amount accounting for the total lactone present.

Oral or intravenous doses of lactone and intravenous doses of dihydroxy acid were recovered completely in the urine. After oral doses of the dihydroxy acid, only 80 percent was found in two of the urine samples. After 50 mg. oral doses of both moieties, the pantothenic acid excretion increased to about 6 mg. per day.

The author concludes from these tests that neither the lactone nor the dihydroxy acid moiety are normal intermediates in the metabolism of pantothenic acid in man.

Absorption and excretion of calcium pantothenate by normal and depleted dogs, R. H. SILBER (*Arch. Biochem.*, 7 (1945), No. 2, pp. 329-336).—The urinary excretion of test doses of calcium pantothenate was significantly greater in normal dogs than in depleted animals whether the doses were given orally or subcutaneously. Intestinal absorption was found to be normal in both groups when tested with oral doses of riboflavin.

Urinary excretion of oral doses of calcium pantothenate ranged from 1 to 50 percent, varying inversely with the amount of food consumed with the vitamin dose. If food were supplied ad libitum, large portions of the dose passed through the intestinal tract unabsorbed. No increase in fecal excretion was noted when the dose was given parenterally.

Tests made on a group of laboratory workers showed that during a 4-hr. period after ingestion of a 50-mg. dose of calcium pantothenate, 10 percent was excreted in the urine.

The fate of tryptophane in pyridoxine-deficient and normal dogs, H. E. AXELROD, A. F. MORGAN, and S. LEPKOVSKY. (*Univ. Calif.*). (*Jour. Biol. Chem.*, 160 (1945), No. 1, pp. 155-164).—Young cocker spaniels, fed purified diets containing 45.8 or 18 percent casein and ample supplements of all vitamins except pyridoxine, excreted kynurenine and xanthurenic acid but no kynurenic acid when fed single doses of 2 gm. of *dl*-tryptophan or 1.5 gm. of *l*(-)-tryptophan. Similarly treated animals, on the same diet supplemented with pyridoxine, excreted kynurenine and kynurenic acid but no xanthurenic acid, except traces after administration of the *dl*-tryptophan. These products did not appear in the urines except after the tryptophan supplement was given.

The dogs excreted xanthurenic acid following the administration of tryptophan after subsisting only 30 days on the pyridoxine-deficient regime. This abnormality continued throughout prolonged periods up to 407 days.

Symptoms in the more severely deficient dogs included nausea, anorexia, and sometimes collapse after ingesting the tryptophan, but the normal animals and those in the earlier stages of the pyridoxine deficiency were unaffected.

The moderate-protein, pyridoxine-deficient diet produced the same symptoms as did the high protein diet, but somewhat less rapidly. The high protein diet supplemented with pyridoxine, adequate pantothenic acid, and all other vitamins except nicotinic acid, and any unknowns except those present in the cornstarch used, allowed young dogs to develop normally, to maintain normal hemoglobin levels, and to metabolize tryptophan normally.

Removal of the spleen had no effect on the course of tryptophan metabolism in the pyridoxine-deficient animals.

Xanthurenic acid fed to one normal and one deficient dog was excreted unchanged in both cases.

On the specificity of dye titration for ascorbic acid, J. TUBA, G. HUNTER, and H. R. STEELE (*Canad. Jour. Res.*, 24 (1946), No. 1, Sect. B, pp. 37-45, *illus.* 3).—Vitamin C was determined by the dye titration method using 2,6-dichlorophenolindophenol in a number of fresh, boiled, and otherwise treated plant materials. Comparative values are given for ascorbic acid assayed by the above method; nonvitamin reductants as determined by the Mapson and the Levy methods; and dehydroascorbic acid as determined by reduction with zinc, with hydrogen sulfide, and by the colorimetric method of Roe.

In the fresh, uncooked materials examined, nonvitamin C reductants were negligible. In the cabbage, peas, and pigweed leaves dehydroascorbic exceeded 10 percent of the ascorbic acid value. Rose hips contained no significant amounts of either dehydroascorbic acid or of nonvitamin C reductants even after long storage at room temperatures. In rose hips the dye titration method gave an accurate measure of ascorbic acid.

It is concluded that the dye titration method determination of vitamin C is highly specific, but in the case of certain cooked foodstuffs nonvitamin C dye reductants may, without check by other methods, introduce significant errors.

Ascorbic acid content of freshly harvested vegetables, F. O. VAN DUYNE, S. M. BRUCKART, J. T. CHASE, and J. I. SIMPSON. (Univ. Ill.). (*Jour. Amer. Dietet. Assoc.*, 21 (1945), No. 3, pp. 153-154).—Vegetables grown experimentally under the supervision of the department of horticulture at the University of Illinois were harvested at the optimum stage of maturity for table use. Ascorbic acid assays were made by the indophenol dye titration method on the day the vegetables were harvested. Several varieties of most of the 14 vegetables tested were studied, assays being made over a 3-yr. period. The tabulation presented gives information by vegetables on variety; date harvested; moisture content; number of determinations; and ascorbic acid content on a fresh weight basis, listing range, mean, and average deviation. The range of ascorbic acid values in milligrams per gram for each of the 14 vegetables was: Broccoli, 0.91-1.72; cabbage, 0.40-0.49; carrots, 0.039-0.160; celtuce (leaves), 0.41-0.55; corn 0.09-0.21; eggplant, 0.027-0.083; mustard greens, 1.07-1.42; peas, 0.19-0.41; rhubarb, 0.056-0.088; snap beans, 0.12-0.28; soybeans, 0.18-0.37; spinach, 0.43-0.77; squash, 0.14-0.18; and Swiss chard (leaves only), 0.25-0.46.

Ascorbic acid content of cabbage salads, V. P. QUINN, F. I. SCOULAR and M. L. JOHNSON (*Food Res.*, 11 (1946), No. 2, pp. 163-168).—Ascorbic acid determinations were made by the indophenol dye titration method of Burrell

et al. (E. S. R., 84, p. 422) after blending the samples in a Waring blender. The Flat Dutch variety of cabbage was used throughout the study.

Samples were carefully prepared and shredded with a stainless-steel knife or a shredder. Assays were made immediately after shredding and after standing 20 min. Losses of ascorbic acid ranged from 34.5 to 42.1 percent after 20 minutes' standing, and were slightly higher in those samples prepared with the shredder.

Other experiments were carried out whereby immediately after shredding one of the following dressings was mixed with the cabbage: French dressing, vinegar mayonnaise, and lemon-juice mayonnaise. Samples were then stored for 30 min. and 5 hr. at room temperature and in the refrigerator.

Results are tabulated and analyzed statistically. The cabbage showed an initial value of approximate 30 mg./100 gm. When mixed with the salad dressing, retention values were found to average 79 percent after standing 30 min. at room temperature and 74 percent after 5 hours' exposure; in the refrigerator, average ascorbic acid values were 86 per cent after 30 minutes' exposure and 81 percent after a 5-hr. period. The lemon-juice mayonnaise offered more protection at both room and refrigerator temperatures than either the French dressing or the vinegar mayonnaise. Both the vinegar and lemon-juice mayonnaise gave higher ascorbic acid retentions than the French dressing.

Ascorbic acid content of tomato varieties and its retention in processed products, C. C. STRACHAN and F. E. ATKINSON (*Sci. Agr.*, 26 (1946), No. 2, pp. 83-94, illus. 1).—Analyses for ascorbic acid of 31 varieties and strains of tomatoes were made using the sodium 2,6-dichlorophenolindophenol dye method of Bessey and King. Results showed marked variation with variety, season, and picking of the tomatoes. The Signet variety was consistently high, having a mean value of 29.8 mg. per 100 gm. over the 3-yr. period studied; Clark Early and Sugawara also showed consistently good values, with 23.8 and 23.0 mg. per 100 gm., respectively.

A survey was made of commercially canned juice and tomatoes in British Columbia and eastern Canada, and their ascorbic acid values were determined. In 1941, British Columbia products showed mean values of 22.3, and 1944 values of 19.8; eastern Canada products showed values of 14.4 in 1942 and 15.0 in 1944.

Factory conditions affecting the retention of ascorbic acid were studied, and analyses of steps in processing revealed that under proper conditions, the total loss from the raw fruit to the finished product should not exceed 11.7-13.5 percent. The effect of methods of extraction and sterilizing time and temperatures on the retention was insignificant, except in those cases of excessive sterilization.

Field illumination and commercial handling as factors in determining the ascorbic acid content of tomatoes received at the cannery, G. F. SOMERS, K. C. HAMNER, and W. L. NELSON. (U. S. D. A. et al.). (*Jour. Nutr.*, 30 (1945), No. 6, pp. 425-433).—Preliminary studies showed wide differences in ascorbic acid content of commercially canned tomato juice bought in the open market—4.6 to 16.1 mg./100 cc. Widest variations occurred with different brands; only minor variations were noted, in general, with different samples of the same brand.

Carefully controlled experiments were made to determine ascorbic acid losses from the time of picking the tomatoes in the field to the arrival at the trimming line in the cannery. Little loss was noted here. On the other hand, considerable variation in the ascorbic acid content was found from one

field of tomatoes to the other. Studies made on the amount of light in each field for 18 days prior to harvest indicated that close correlation existed between light and the ascorbic acid content of tomatoes.

The authors suggest that variations in the initial amount of ascorbic acid content of the fresh tomatoes may be an important factor in the final content of market tomato juice.

TEXTILES AND CLOTHING

Operating instructions and test procedure for A. A. T. C. C. flammability tester (*Amer. Dyestuff Rptr.*, 35 (1946), No. 9, pp. 230-232, illus. 2).—This is a tentative test method for evaluating textile materials for flammability characteristics by measurement of the rate of burning. The sample is combed, dried, dessicated, and tested on the apparatus described. The results on five sample tests are averaged, and if the fabric burned in 6 sec. or higher, it is not considered dangerously flammable. As suggested in the interpretation of the test results, no individual sample should show a flammability rate less than 5 sec.

The resistance of treated cotton fabrics to attack by termites and micro-organisms, R. A. ST. GEORGE and M. S. FURRY. (U. S. D. A.). (*Amer. Dyestuff Rptr.*, 35 (1946), No. 8, pp. 207-210, illus. 1).—"The effectiveness against attack, both by termites and by micro-organisms, of 16 finishing treatments applied to cotton fabric has been determined. In general, finishing treatments that protect fabric from attack by termites also made it resistant to micro-organisms. However some effective mildew-resistant treatments allowed slight attack by termites, and two allowed heavy attack.

"The following treatments gave excellent protection against attack by both agencies: Cuprammonium hydroxide, copper oleate, a mixture of copper naphthenate and copper oleate, mercuric chloride with 8-hydroxyquinoline, and copper naphthenate. The following treatments permitted light attack by termites and, with the exception of cuprammonium fluoride, gave excellent protection against micro-organisms: Cuprammonium fluoride, copper sulfate with 8-hydroxyquinoline, and two different proportions of each of two natural dye extracts, Osage orange and quercitron, with copper sulfate and potassium dichromate. The remaining five treatments, under the conditions of this test and in the concentrations used, were ineffective in preventing termite damage."

The effect of weathering on cotton fabric containing certain copper rot-proofers, C. H. BAYLEY and M. W. WEATHERBURN (*Canad. Jour. Res.*, 24 (1946), No. 3, Sect. F, pp. 193-202).—"On exposure to outdoor weathering for 3 mo., No. 8 cotton duck showed substantial loss in breaking strength. The untreated fabric showed a loss of the same order as the losses of samples treated with copper naphthenate, copper hydroxynaphthenate, copper oleate, and copper tallate containing 0.1 to 1.0 percent copper. The copper treated samples showed slight evidence of increased actinic degradation as measured by cuprammonium fluidity. There was an appreciable decrease in the copper content of the treated samples on weathering. The decrease in copper content and breaking strength on weathering and the extent of attack by micro-organisms in soil burial testing were reduced considerably by the presence of a waterproofing compound of the wax-pigment-filler type. The initial water resistance of the proofing was modified by the presence of the copper compounds, being reduced by copper naphthenate, oleate, and tallate and increased by copper hydroxynaphthenate, although on aging and weathering these effects were minimized."

Evaluation of fastness to atmospheric fumes of dyed cellulose acetate rayon (*Amer. Dyestuff Rptr.*, 35 (1946), No. 7, pp. 174-176, illus. 5).—Testing procedures for determining the fading resistance of dyed cellulose acetate rayon to fumes while in general storage, after dry cleaning, and washing are covered. Three forms of suitable apparatus for exposing the samples to the air and to gas are illustrated.

A low cost reflectometer and method for comparing detergency, M. L. HURWITZ (*Amer. Dyestuff Rptr.*, 35 (1946), No. 3, pp. 83-84, illus. 2).—The procedure described consists of soiling, laundering, and comparing samples of material treated under standard conditions of temperature, time and action. The cleansing action of the various detergents used in the washing test is measured by the brightness of the samples, which is obtained from direct readings on the microammeter of the 45° reflectance" reflectometer described. The test method and equipment discussed yield reproducible results, and numerical indices can be assigned to the value of the various detergents.

REPORTS AND PROCEEDINGS

Report of the Federal Experiment Station in Puerto Rico, 1945. (Partly coop. U. S. D. A. et al.). (*Puerto Rico Fed. Sta. Rpt.* 1945, pp. 62+).—This report notes progress on the propagation, physiology, and culture of derris and the effect of storage on undried derris root; the relative toxicity of seed of the mamey tree (*Mammea americana*) and pyrethrum; toxicological value of other native plants; *Cinchona* propagation, culture, and genetics, and its susceptibility to insect pests; variety tests with onions, lettuce, cabbage, tomatoes, and other vegetables, and tests of vegetables at higher altitudes; direct seeding of mangosteen (*Garcinia mangostana*); plant introduction and distribution; fertilizer and seed production tests with Manila grass (*Zoysia matrella*); physiological studies of the tapping of the Para rubber-tree; protection of seed corn ears from storage insects; damage of sugarcane by the sugarcane root caterpillar; insect parasites and predators; DDT for control of the West Indian fruitfly (*Anastrepha mombinpraeoptans*) and cockroaches; bamboo culture and utilization and control of powder-post beetle infestations; vanilla culture and processing; culture of lemon grass (*Cymbopogon citratus*); citronella grass varieties; culture of bay trees and Chinese ginger; processing of essential oils; variety tests with coffee; tropical kudzu (*Pueraria phaseoloides*) as a cover crop; and pasture tests with molasses grass and trailing indigo.

Fifty-third Annual Report of [Wyoming Station, 1943], J. A. HILL (*Wyoming Sta. Rpt.* 1943, pp. 50).—This report contains notes from the station and substations in agricultural economics on the income on Star Valley dairy farms and current and past beef prices; soil management, including pasture improvement studies, leaching and treatment with gypsum and alum to remove soil alkali, and use of irrigation water and rock phosphate; forage crops, including studies of grazing practices, forms of selenium poisoning, nitrate poisoning from feeds, and feeding value of range grasses; feeding habits of grasshoppers; plant diseases, including disinfection for ring rot in potatoes, relation of excess moisture to potato scab, seed treatment of cereals for blight and smut, and varieties of beans resistant to fungi; cattle and sheep, including vitamin A requirements of breeding ewes, sheep breeding, cattle feeding on native hays, alfalfa, bonemeal, and beet pulp, calf feeding on concentrated skim milk, corn gluten feed and cottonseed meal for turkeys, and balanced rations for pullets; animal diseases, including studies on leukemia control, causes of calf diphtheria, and sheep abortion;

wool prices and use of canvas coats on sheep to increase wool production; bees, including resistance to American foulbrood and control measures, development of *Bacillus* larvae, and studies of nosema disease and paralysis of adult bees; foods and nutrition, including the blanching of vegetables before freezing, vitamin preservation in canned beans, cooking quality in potatoes, honey as a sugar substitute, preservation of compressed yeast, and effect of altitude on cooking time; pasture mixtures; cultural studies with wheat, oats, barley, corn, beans, potatoes, sugar beets, and crested wheatgrass; variety tests of potatoes, corn, wheat, oats, barley, alfalfa, and soybeans; control of quackgrass; rotations; trees adapted to the region; early-hatched v. late-hatched chicks; relation of sunshine to egg production; steers on pasture v. dry-lot feeding; rations for lambs and pigs; and meteorological observations.

MISCELLANEOUS

Minnesota Farm and Home Science [May 20, 1946] (*Minn. Farm and Home Sci.* [Minnesota Sta.], 3 (1946), No. 3, pp. 16, illus. 18).—In addition to several articles noted elsewhere in this issue, this number contains Forreast Rhinehart Immer, 1899–1946, by C. H. Bailey (p. 10) (E. S. R., 94, p. 558); Silage Gives Good Results as Lamb-Feeding Roughage (p. 14); Lead Paint Will Kill Cattle (p. 14); What Capital is Needed to Farm in the Midwest, an epitome of Bulletin 389 (E. S. R., 95, p. 117); and Let's Farm Safely, by C. H. Bailey (p. 16).

Research and Farming [January 1946] (*Res. and Farming* [North Carolina Sta.], 4 (1946), Prog. Rpt. 2, pp. 12, illus. 12).—In addition to several articles noted elsewhere in this issue, this number contains Looking Ahead With the Farmer, by G. W. Forster (pp. 1–2), an economic discussion of the farm outlook; and [Deaths in Turkey Hens], by R. S. Dearstyne, C. H. Bostian, and W. B. Nesbit (p. 3), an analysis of causes of death in the station flock.

Agriculture in the Americas [June-July 1946] (*U. S. Dept. Agr., Agr. in Americas*, 6 (1946), No. 6-7, pp. 95–110+, illus. 13).—In addition to an article abstracted elsewhere in this issue and miscellaneous notes, this number contains Pan American Day Observance Stresses Agricultural Cooperation, by C. J. Ortega (pp. 95–97, 107, 110); West Indian Conference Studies Caribbean Agriculture, by E. Englund (pp. 101–103, 106); and The Iowa State College Tropical Research Center (E. S. R., 94, p. 557), by C. E. Friley (pp. 104–105) (Iowa State Col.).

[Notes on South American agriculture] (*U. S. Dept. Agr., Agr. in Americas*, 6 (1946), No. 4, pp. 63–73, 75, 76, illus. 15).—In addition to an article noted on page 505, this number contains Colombian Cattle Transportation, by J. A. Hopkins (pp. 63–66, 75, 76); Farming From Sea to Clouds, by O. Moore (pp. 67–70), an account of Peruvian agriculture; and Mexico's Istle Industry, by B. du Frane (pp. 71–73).

L'activité de l'Institut International d'Agriculture pendant la guerre (1940-1945) (*Rome: Inst. Internatl. Agr.*, 1945, pp. 110).—The progress of the Institute and its various parts during World War II is reported.

Biological action of radiations, J. WEISS (*Nature* [London], 157 (1946), No. 3992, p. 584).—A preliminary account on the biological action of irradiation—e. g., with X-rays, α -particles, neutrons, etc.

NOTES

Connecticut [New Haven] Station.—David C. Walden, analytical chemist and a member of the staff for 19 years, died September 13 at the age of 41 years. A son of the late B. H. Walden (E. S. R., 94, p. 414), he was a graduate of Wesleyan University in 1927. In addition to routine analytical work he had given special attention to causes of livestock poisoning.

Florida Station.—*Veterinary Medicine* notes that Dr. Glenn B. Van Ness, instructor and assistant veterinarian at the Arkansas University and Station, has been appointed associate poultry pathologist.

Idaho University and Station.—Dr. D. R. Theophilus, head of the department of dairy husbandry, has been appointed dean of the college of agriculture, director of the station, and director of the extension division, effective November 1.

Illinois University and Station.—Dr. L. E. St. Clair, assistant professor of veterinary anatomy in the Iowa College, has been appointed head of the department of veterinary anatomy in the College of Veterinary Medicine and chief of veterinary anatomy in the station.

Iowa College and Station.—Dr. H. L. Wilcke, head of the poultry husbandry activities, has resigned to engage in commercial work. Dr. A. G. Norman, professor of soils, has accepted a position with the War Department with headquarters at Camp Detrick, Frederick, Md.

Louisiana University.—Lindsay S. Olive has been appointed associate professor of botany.

Michigan College and Station.—Dr. T. A. Merrill, research associate and extension horticulturist, has been appointed head of the department of horticulture in the Washington College and chairman of the division of horticulture in the Washington Station.

Cornell University and Station.—An appropriation of \$50,000 was made by the last legislature for research, teaching, and experimental work with ducks and turkeys. Although concentrated heavily in a single county (Suffolk) on Long Island, which raises 95 percent of the ducks in the State and 45 percent of all in the United States, the duck industry has produced an annual income to farmers of about \$10,000,000, and turkey values of about \$3,000,000. Investigations on disease control will be carried on by the New York State Veterinary College, those with turkeys at Ithaca and those with ducks at a branch station at Farmingdale. Studies on production will be handled by the department of poultry husbandry of the College of Agriculture at Ithaca.

Dr. E. F. Phillips, professor of apiculture since 1924 and for 19 years previously in charge of the apicultural investigations of the U. S. Department of Agriculture, has retired.

New York State Station.—Dr. John I. Shafer, assistant professor of vegetable crops, has resigned to go into commercial work and has been succeeded by Curtis H. Dearborn. Dr. John C. Cain, assistant horticulturist on military leave from the Florida Station, has been appointed associate professor of pomology, effective November 1.

North Carolina College and Station.—The first state-wide 4-H Club meeting since the opening of World War II broke all attendance records with an enrollment of about 1,300 boys and girls.

Recent appointments include Dr. John M. Jenkins, Jr., associate horticulturist of the South Carolina Truck Station, who will be in charge of vegetable research at the Soils Research Laboratory; Ruby Scholz, specialist in food conservation and marketing; Rose E. Bryan and Lorna Langley, assistants in home management; and Dr. Joseph A. Weybrew, animal nutritionist in the station. J. G. Lassiter, extension horticulturist, has resigned to engage in commercial work.

Ohio State University and Station.—A department of dairy husbandry has been established in the College of Agriculture to be headed by Dr. W. E. Krauss, chief of the division of dairy industry in the station. The first full-fledged dairy day to be held at the station since the close of the war drew an estimated attendance of about 4,000.

John G. Dean, Jr., agent in cooperative alfalfa investigations for the U. S. Department of Agriculture, has also been appointed assistant in agronomy in the station with headquarters at Columbus.

Texas Station.—*Science* notes that Dr. B. S. Pickett, horticulturist at the Weslaco Substation, has resigned to become professor of horticulture in the University of Georgia. B. S. Schweigert has been appointed nutritionist.

Utah College and Station.—Dr. Joseph E. Greaves, head of the department of bacteriology and biochemistry since 1927 and associated with the institution since 1907, retired on June 30 as professor emeritus but with some part-time teaching.

U. S. D. A. Agricultural Research Administration.—Dr. W. V. Lambert has been appointed administrator as of November 1 vice P. V. Cardon, who has become special assistant in the Bureau of Plant Industry, Soils, and Agricultural Engineering.

War Damage in the Far East.—A report to the U. S. D. A. Office of Foreign Agricultural Relations announces that following the Japanese occupation classes at the Philippine College of Agriculture were continued, together with most essential activities except publications. A recuperative camp for released Filipino war prisoners was established on the campus in 1942 and an internment camp for Allied nationals in 1943, but the college plant was virtually intact to the very last day of Japanese occupation. However, on February 26 and 27, 1945, nearly all buildings were burned, including libraries, records, collections, and equipment, with the loss of life of some personnel. Survivors of the prewar staff, numbering 45, furnished the nucleus available for reopening in July, 1945, with about 300 students. Most of their efforts have been necessarily directed to salvaging and reconstruction. Much progress has been made, including a considerable replenishing of the library by donations from the U. S. Department of Agriculture, State experiment stations, American scientific societies, publishers, and private individuals. An immediate minimum appropriation of 534,500 pesos (\$267,250), exclusive of salaries, is needed for reestablishment, with a long-range program of 1,448,500 pesos. Thus far no appropriations have been made.

Ford M. Milan has recently been appointed by the U. S. War Department to be director of all experiment stations in the American zone in Korea. He reports that libraries of all the agricultural institutions there are in very poor condition.

EXPERIMENT STATION RECORD

Vol. 95

NOVEMBER 1946

No. 5

RECENT WORK IN AGRICULTURAL SCIENCE¹

AGRICULTURAL AND BIOLOGICAL CHEMISTRY

Effects of papain, yeast water, cysteine, and glutathione on gluten dispersion or on disintegration as indicated by gluten recovery and by mixogram patterns, C. O. SWANSON and A. C. ANDREWS. (Kans. Expt. Sta.). (*Cereal Chem.*, 22 (1945), No. 2, pp. 134-149, illus. 4).—The authors found obvious similarities in the mixogram patterns produced by the presence of yeast water, cysteine, and glutathione. The modifications in the patterns were much greater when the dough was mixed after rest periods than with continuous mixing. Both glutathione and cysteine contain sulphydryl groups, and the boiled yeast water gave a strong nitroprusside test. It appeared that the modifications in patterns caused by these three reactive substances are influenced by such groups. None of the quantities of the three substances used in the present investigation caused decreases in recoverable wet gluten comparable with papain.

The mixogram patterns produced with papain were similar to those with the other three substances from continuous mixing, but with rest periods papain produced distinct pattern differences. Papain showed the most pronounced differences in the quantities of recoverable wet gluten. By increasing the quantities of papain or by lengthening the rest periods the quantities of recoverable gluten were greatly decreased, and no gluten could be recovered when the rest periods were sufficiently prolonged indicating enzymatic disintegration. No such effect with the use of yeast water, cysteine, or glutathione was indicated. Any activation by these three substances of latent proteases present in the flour which might cause enzymatic degradation was not made evident by significant decreases in the quantities of recoverable wet gluten.

Preparation of the egg yolk lipoprotein, lipovitellin, G. ALDERTON and H. L. FEVOLD. (U. S. D. A.). (*Arch. Biochem.*, 8 (1945), No. 3, pp. 415-419).—A convenient method for the preparation of the lipoprotein from egg yolk consisted in collecting the crude lipoprotein by passing diluted egg yolk through a Sharples centrifuge and extracting the precipitate with cold ether.

¹ The publications abstracted in these columns are seldom available for distribution by the Office of Experiment Stations. In general, application should be made to the Office of Information of the U. S. Department of Agriculture, Washington 25, D. C., for publications of the Department; to the directors of the State agricultural experiment stations, as listed on page 3 of the cover of this issue, for publications of the several experiment stations; and to publishers of books and journals for material issued by them. Microfilms and photostatic copies, the latter legible without magnifying equipment, may be purchased from the Library, U. S. Department of Agriculture, Washington 25, D. C. Rates and other details will be supplied by the Library on request.

The product thus obtained contained, in addition to lipovitellin, phosphorus-containing substances which were removed by solution in 10-percent NaCl and precipitation by dialysis. The analytical data for the final product agreed well with published values. Approximately 18 percent of egg yolk solids was found to be lipovitellin; roughly 17 percent was isolated by the reported method. The lipoprotein contained approximately 16 to 18 percent of a phosphate, which appeared to be largely lecithin.

The sulfur content of the pepsin digestible fraction of protein concentrates. R. J. EVANS. (Wash. Expt. Sta.). (*Arch. Biochem.*, 7 (1945), No. 1, pp. 33-40, illus. 1).—The author digested 2-gm. samples of the ether-extracted protein with pepsin, as in the estimation of the indigestible fraction of the protein, and determined the sulfur as sulfate after complete oxidation of the protein fraction not dissolved by the pepsin by means of nitric and perchloric acids in accordance with the procedure of Evans and St. John (E. S. R. 95, p. 20). The "digestible" organic sulfur of a protein concentrate is defined as the organic sulfur minus the sulfur not dissolved by pepsin. A coefficient of correlation of +0.925 between the digestible organic sulfur of the protein and the gross protein value of animal protein concentrates was obtained. A coefficient of correlation of +0.877 between the digestible organic sulfur and the chemical protein quality index was computed. From the results observed, it appeared that the pepsin-digestible organic sulfur might have been the limiting factor for the animal protein concentrates and peas studied, but was not the limiting factor for the soybean oil meals or cottonseed meals with the type of diet fed.

The free tryptophane content of human urine, B. S. SCHWEIGERT, H. E. SAUBERLICH, and C. A. ELVEHJEM. (Wis. Expt. Sta.). (*Science*, 102 (1945), No. 2646, pp. 275-277).—The microbiological method with *Lactobacillus arabinosus* as the test organism was used to estimate *l*-tryptophan. Nine normal men consuming average diets served as subjects. Details of the method are presented briefly. Recovery of added tryptophan was found satisfactory at different levels of the test samples.

Results showed excretion of 12 to 30 mg. per day as contrasted to values about 10 times greater obtained by Albanese and Frankston (E. S. R., 95, p. 20). Reasons for the differences obtained by the two methods are discussed.

Some observations on the acid inversion of sucrose, T. R. FREEMAN. (Fla. Expt. Sta.). (*Jour. Dairy Sci.*, 29 (1946), No. 2, pp. 101-113).—The author finds that the commercial "inversion" of sucrose by heating its water solution in the presence of acid seldom produces a sirup identical in composition with that which theoretically should be obtained. Invert sirups prepared by boiling and by heating at 190° F. contained more dextrose than levulose, but sirups prepared by heating at 175° contained more levulose than dextrose. The optimum acidity for inverting sucrose at boiling temperature was that of the pH range from 2.0 to 2.6. At the lower heating temperature (175° and 190°), pH values of approximately 1.65 to 1.75 were necessary to obtain satisfactory inversion. Preliminary studies indicated that any of the following acids could be used for making invert sirup: Tartaric, citric, lactic, hydrochloric, sulfuric, and phosphoric. There was a slight improvement in the inversion process as the water content of the uninverted sirup was increased from 27.5 percent to 35.1 percent. Although some discrepancy in the results secured with different boiling periods was noted, 30 min. seemed to be the best average. Invert sirup of good quality was prepared at 175° and 190° by holding the sirup at these temperatures for 45 to 90 min. The exact tem-

perature and time were found to be factors less critical than pH. Sirup prepared with phosphoric acid was found to be as good, on a "Theoretical Sweetness Index" basis, as sirup prepared with tartaric acid, the Theoretical Sweetness Index being defined as the sum of the percentages of the total reducing sugars and of the levulose in the invert sirup. The highest values of this index as here tabulated were obtained by heating at 175° for 120 min. with tartaric acid (index value, 108.91) and for 90 min. with phosphoric acid (index value, 108.58).

Sunflower and safflower seeds and oils, R. T. MILNER, J. E. HUBBARD, and M. B. WIELE. (U. S. D. A.). (*Oil & Soap*, 22 (1945), No. 11, pp. 304-307).—Chemical analyses of sunflower and safflower seeds, the hulled seed, and the hulls and oils were made. The 28 samples of sunflower seed, representing 4 varieties grown at 7 locations, contained an average of 29 percent oil which was composed chiefly (51 to 68 percent) of linoleic acid glycerides. The 8 varieties of safflower seeds grown at Huntley, Mont., contained an average of 33 percent oil, with an average content of 78 percent linoleic glycerides. Percentages of ash, nitrogen, sugar, and for the whole seeds and their fractions are presented.

The preparation of stearic acid from castor oil, H. A. SCHUETTE and D. A. ROTH. (Univ. Wis.). (*Oil & Soap*, 22 (1945), No. 11, pp. 294-295).—By dehydroxylating the 12-hydroxystearic acid, which was prepared in a pure state by the alcoholysis of fully hydrogenated castor oil, there was obtained in at least 40 percent yield an exceptionally pure stearic acid of which the solidification point was 69.33° C. The procedure described avoids recourse to the necessity of preparing lead soaps for the removal of unsaturated fatty acids and the drudgery of repeated crystallizations as prescribed by other published methods.

The elimination of flavor reversion in linseed shortening by heat polymerization and solvent segregation of the oil, O. S. PRIVETT, R. B. PRINGLE, and W. D. MCFARLANE (*Oil & Soap*, 22 (1945), No. 11, pp. 287-289, *illus.* 2).—The authors established optimum conditions for the high temperature polymerization and solvent segregation of linseed oil to produce a "non-reverting" edible shortening and an improved drying oil. The best oil was obtained by heating at 270°-275° C. for 12-15 hr. while carbon dioxide was continuously passed through the oil. Under these conditions the polymerized oil had a refractive index of 1.4858 to 1.4861 at 25°, and yielded 60-65 percent of acetone soluble oil with a refractive index of 1.4830 to 1.4834 at 25° and an acid value of less than 1 percent, calculated as oleic acid. Pie crusts containing shortenings made from the acetone-soluble fraction of the oil were judged to be of good quality. The best shortenings were obtained by hydrogenating to a refractive index of 1.4615-1.4605 (60°).

The effect of various reagents on adrenocorticotrophic hormone, C. H. LI, M. E. SIMPSON, and H. M. EVANS. (Univ. Calif.). (*Arch. Biochem.*, 9 (1946), No. 2, pp. 259-264).—The effects of ketene, nitrous acid, formaldehyde, and iodine on the adrenocorticotrophic hormone were such as to suggest that both the free amino and tyrosine groups are essential for the hormonal action.

Growth requirements of a purine-deficient strain of *Neurospora*, J. G. PIERCE and H. S. LORING (*Jour. Biol. Chem.*, 160 (1945), No. 2, pp. 409-415, *illus.* 1).—In work based essentially upon the technic devised by Horowitz and Beadle (E. S. R., 92, p. 8), the authors have studied the growth requirements of *Neurospora* strain 3254. This mutant requires adenine or certain closely related compounds for adequate growth. In a basal medium composed of simple

salts, sugar, and biotin, the following supplements produced adequate growth of the organism: Adenine, oxyadenine, adenosine, and hypoxanthine.

"Adenine in combination as nucleoside, nucleotide, ribonucleic acid, or cozymase is also available for growth, but the relative activity of these compounds is dependent on the amount of adenine present. The rate of growth on extracts of several natural products, including liver, malt, and *Neurospora*, shows that one or more of the active compounds mentioned above is present in such preparations."

Propionic acid, sodium propionate, and calcium propionate as inhibitors of mold growth.—II, Studies pertaining to the active agent responsible for the inhibitory effect of the propionates, J. C. OLSON, JR., and H. MACY. (Minn. Expt. Sta.). (*Jour. Dairy Sci.*, 29 (1946), No. 3, pp. 173-180, illus. 3).—The equation for acid dissociation was applied to data concerning inhibition of the growth of *Hormodendrum cladosporioides*. The concentrations of undissociated propionic acid, propionate ions, and total propionate in the media are given, showing their relationship to the inhibition of the growth of this mold. No correlation between growth and concentration of total propionate or propionate ions was apparent. Increased inhibition of growth could be observed with a corresponding increase or decrease of pH. The undissociated acid was the only component for which a correlation with growth inhibition was obtained. Growth gradually diminished as the concentration of undissociated propionic acid increased. The critical concentration at which growth was completely inhibited was within the range 0.0105-0.0106 M. Within the range of these data, at least, hydrogen ions and propionate ions were of importance only insofar as they affected the concentration of undissociated acid.

The role of corn steep liquor in the production of penicillin. J. P. BOWDEN and W. H. PETERSON. (Wis. Expt. Sta.). (*Arch. Biochem.*, 9 (1946), No. 3, pp. 337-399).—No satisfactory substitute for corn steep liquor was found among more than 20 natural materials tested. Some of these, however, particularly meat scraps meal and potatoes, supplemented the action of corn steep liquor in increasing the yield of penicillin. Samples of corn steep liquor from different manufacturers varied greatly in their penicillin-producing capacity, but the variations were as great in lots from the same manufacturer as in lots from different manufacturers. Fermentation of the corn steep liquor with yeast seemed to increase rather than decrease the penicillin-producing potency. The optimum level of corn steep solids in shaken flasks was found to be 2 percent when either *Penicillium notatum* 832 or *P. chrysogenum* X-1612 were used. Data obtained with larger volumes of medium under aeration and agitation indicated that 4 percent corn steep solids was optimal. The most potent steep prepared in the laboratory was obtained from sprouted corn, extracted at 65° C., pH 6, in the presence of 0.24 percent Na₂SO₄. The most active part of the steep liquor was extracted from the corn during the first 24 hr.

Distribution and general properties of an amylase inhibitor in cereals. E. KNEEN and R. M. SANDSTEDT. (Nebr. Expt. Sta.). (*Arch. Biochem.*, 9 (1946), No. 2, pp. 235-249, illus. 1).—The presence in wheat endosperm of a substance which inhibits salivary and pancreatic amylases was demonstrated. This substance inhibited also the amylase produced by the growth of certain, bacterial isolates. A similar water-soluble inhibitor was found present in rye and in Leoti and Schrock sorghums. No evidence of the presence of inhibitor in other cereals could be detected. The inhibiting substance was shown to be resistant to the action of temperatures at or below that of atmospheric

boiling but to be destroyed by autoclaving. It was soluble in water, very dilute salt solutions, and dilute ethyl alcohol, but was insoluble in concentrated ammonium sulfate solutions, in ether, and in 90-percent ethyl alcohol. It did not pass through cellophane dialysis membranes. The reaction of the inhibitor with salivary amylase was reversible. From a mixture of the two, salivary amylase could be precipitated practically free from inhibitor by 70-percent alcohol.

The presence of an inhibitor of both salivary and pancreatic amylase in wheat or wheat flour even when cooked by the usual procedures appeared to have little physiological significance. It was destroyed by the action of pepsin and, with normal proteolysis, would not be effective during digestion by pancreatic enzymes.

The mode of action of an amylase inhibitor from wheat, W. MILITZER, C. IKEDA, and E. KNEEN. (Univ. Nebr.). (*Arch. Biochem.*, 9 (1946), No. 3, pp. 321-329, *illus.* 1).—This paper reports upon an extension of the above observation of Kneen and Sandstedt that wheat, rye, and some sorghums contain a proteinaceous substance inhibitive toward salivary, pancreatic, and some bacterial amylases. The present paper discusses the inhibitory effect toward salivary amylase action upon starch from the viewpoint, especially, of reaction kinetics.

The effectiveness of the inhibitor, as obtained from wheat, increased when its solution was held up to 91 hr. The reaction between the salivary amylase, starch, and the inhibitory substance was found to constitute a noncompetitive inhibition. The experimental evidence indicated the tryptophan of the inhibitor protein as the essential amino acid component of the molecule. Reagents known to be specific for tryptophan inactivated the inhibitor. The active inhibitor did not yield a nitroprusside test for the sulfhydryl group. Sodium cyanide reduction produced sulfhydryl groups but did not inactivate the inhibitor. The tyrosine unit was not found to be present. The inhibitor gave strong tryptophan reactions. The inhibitor was inactivated by compounds reacting with amino groups (phenyl isocyanate) or with the indole grouping of the tryptophan residue (aldehydes).

The preparation and properties of an amylase inhibitor of wheat, W. MILITZER, C. IKEDA, and E. KNEEN. (Univ. Nebr.). (*Arch. Biochem.*, 9 (1946), No. 3, pp. 309-320, *illus.* 1).—The amylase inhibitor from wheat was purified by adsorption and elution from aluminum hydroxide, a 750-fold concentration from the original wheat being effected. The inhibitor was precipitated from solution by protein precipitants, did not dialyze through a viscose membrane, and was inactivated by nitrous acid and by digestion with ficin. It was concluded that the inhibitor is a protein.

On dialyzing a solution of the purified inhibitor against distilled water inactivation occurred. This did not occur when dialysis was carried out against tap water, sodium chloride, or phosphate buffer. At alkaline pH values the inhibitor was readily denatured at 95° C. in 10 to 15 min. At acid pH values it was much more stable and required more than 60 min. Sodium sulfite, hydrogen sulfide, and ascorbic acid inactivated the inhibitor. Chlorine, bromine, sodium chlorite, and hydrogen peroxide caused a destruction of the inhibitor more readily than did the reducing agents mentioned.

Sorghum amylase, E. KNEEN. (Nebr. Expt. Sta.). (*Cereal Chem.*, 22 (1945), No. 2, pp. 112-134, *illus.* 6).—The amylase system of sorghum malt was found to be composed of an α -amylase accompanied by relatively minute quantities of β -amylase. Both of these amylases appeared to be similar in many properties to the corresponding components of the barley malt system.

When compared with barley α -amylase, the α -amylase of sorghum malt had the same optimum pH range for activity (in the neighborhood of pH 4.5), a similar trend in exhibiting a stability optimum at a higher pH value than that optimum for activity, a similar relationship between starch liquefying and starch dextrinizing activities, and a comparable lack of efficiency in the conversion of starch to fermentable sugars. Sorghum α -amylase was similar to that of barley malt in thermostability, and it too was stabilized in this respect by the presence of calcium ions. It differed in showing a lower production of reducing groups per unit of α -dextrinizing activity in the initial stages of starch conversion.

The traces of β -amylase in sorghum malt were too minute to be recorded by customary methods of evaluation. The content of this enzyme was determined by comparing the action of a sorghum malt extract with the action of sorghum α -amylase (heated extract) over an extended period of saccharification. The β -amylase activity was found to be of the same order of the α -amylase activity of ungerminated cereals—from one hundredth to one thousandth of the activity of a cereal rich in β -amylase. These minute amounts of β -amylase were sufficient to influence greatly the post-dextrinization saccharification of starch by sorghum malt extracts; a level of conversion to fermentable sugars approaching that brought about by barley malt was obtained by prolonged action.

The starch conversion limits from the actions of sorghum malts appeared to be modified by another factor in addition to α - and β -amylase. This third component, tentatively called "dextrinase," may be influential in the splitting of dextrans to fermentable sugars.

Lipoxidase, E. L. COSBY and J. B. SUMNER. (Cornell Univ.). (*Arch. Biochem.*, 8 (1945), No. 2, pp. 259-264, illus. 1).—The authors have devised a method for the purification of soybean lipoxidase by means of which the enzyme is concentrated 60-fold. An adaptation of the qualitative carotene decolorization test for lipoxidase assay is also described. In contrast to the observations reported by Balls, Axelrod, and Kies (*E. S. R.*, 90, p. 436), the present authors found no activating effect to be produced by the purified "activator" described by the preceding investigators. Some crude preparations of the activator had an apparent activating action, but this was shown to be due to the fact that the crude activator was itself capable of lipoxidase activity.

Studies on the enzyme which produces the *Streptococcus lactis* R-stimulating factor from inactive precursor substance in yeast, M. LASKOWSKI, V. MIMS, and P. L. DAY. (Univ. Ark.). (*Jour. Biol. Chem.*, 157 (1945), No. 2, pp. 731-739, illus. 4).—The enzyme which produces the *S. lactis* R growth-stimulating factor from inactive precursor substances in yeast has been assayed quantitatively. The distribution of the enzyme has been studied in the organs of the rat, and in a few organs of the dog, hog, cow, rabbit, and chicken.

The partial purification of this enzyme is described. It involves treatment with calcium phosphate gel, precipitation with alcohol, and repeated concentration of the solution and salting-out with sodium sulfate. By this method, a preparation with an average potency of 200 units per mg. of protein, with a yield of 70 percent, was obtained from chicken pancreas. This enzyme exhibits optimal activity between pH 7 and 8, it is rapidly inactivated by exposure to temperatures above 45°, and it is relatively stable to the action of crystalline trypsin.

Studies on vitamin B₁₂ conjugase from chicken pancreas, V. MIMS and M. LASKOWSKI. (Univ. Ark.). (*Jour. Biol. Chem.*, 160 (1945), No. 2, pp. 493-

508, *illus. 4*).—Continuing the studies described above, the authors present an improved method for the preparation of chicken pancreas conjugase. This method consists of autolysis for 24 hr. at pH 8 at 32° C., followed by fractional precipitation with ammonium sulfate (40 to 80 percent saturation at pH 7), precipitation with alcohol, and a second fractionation with ammonium sulfate.

Chicken pancreas conjugase was activated in the presence of calcium, the optimal concentration being 0.01 M. Optimal pH and temperature were found to be 7.8 and 32°, respectively.

The authors propose a new unit of conjugase defined as 10 times the amount of enzyme which produces 0.1 γ of vitamin B₆ when incubated with 1 γ of vitamin B₆ conjugate for 1 hr. at 32° in the presence of 0.01 M CaCl₂ in 0.2 M borate buffer, pH 7.8, total volume 1 cc. "Increase of reducing power was observed as a result of incubation of the conjugase with several different substrates and was found to parallel the release of vitamin B₆, but no decisive evidence was accumulated to show that this was due to a release of a sugar."

Stereochemical configuration and provitamin A activity.—IV, Neo- α -carotene B and neo- β -carotene B, H. J. DEUEL, JR., C. JOHNSTON, E. R. MESERVE, A. POLGAR, and L. ZECHMEISTER. (*Arch. Biochem.*, 7 (1945), No. 1, pp. 247–255, *illus. 3*).—The preceding papers of this series were abstracted in another section (E. S. R., 93, p. 803).

In the work here noted, neo- α -carotene B and neo- β -carotene B were shown to be stable for at least 2 weeks when dissolved in a commercial, edible cottonseed oil and kept under carbon dioxide in the dark at 4° C. The provitamin A activity of neo- α -carotene B was found to be 30 percent of that of all-trans- α -carotene, while neo- β -carotene B exhibited a potency which corresponded with 53 percent of that of all-trans- β -carotene. Some general conclusions concerning the structure, configuration, and provitamin A activity of carotenes are offered.

Absorption spectrum of ζ -carotene, H. A. NASH and F. P. ZSCHEILE. (Ind. Expt. Sta.). (*Arch. Biochem.*, 7 (1945), No. 2, pp. 305–311, *illus. 2*).— ζ -Carotene was prepared in solution by extraction of fruits from special tomato strains. After repeated adsorption-column separations upon various adsorbents and a saponification procedure to remove a waxy impurity, specific absorption coefficients were calculated from weight data obtained by evaporating the solutions to dryness in a CO₂ atmosphere. Absorption curves and specific absorption coefficients are presented. This carotene exhibited typical isomerization phenomena, and the shape of its absorption curve was similar to that of lycopene. It is believed that this compound may occur in nature in a wide variety of sources.

Desthiobiotin in the biosynthesis of biotin, E. L. TATUM. (*Jour. Biol. Chem.*, 160 (1945), No. 2, pp. 455–459, *illus. 1*).—An X-ray produced mutant of *Penicillium chrysogenum*, strain 62078, was found to require biotin for growth but was unable to grow in the presence of desthiobiotin. Filtrates made from a culture of strain 62078 (grown on biotin) were tested with the following organisms: *Neurospora crassa* 1A, *Escherichia coli* strain 58, and *Penicillium notatum* strain 21464. These three organisms, which respond to both biotin and desthiobiotin, grew well when the filtrates were substituted for biotin in the medium. Strain 62078 was unable to grow when the filtrate replaced biotin in the usual medium.

From these results, the author suggests that the mutant, strain 62078, has synthesized desthiobiotin, which is a normal intermediate in the biosynthesis of biotin by *P. chrysogenum*.

Addition of pimelic acid to the biotin-containing medium in which strain 62078 is grown increased the production of active substance (desthiobiotin) approximately tenfold. The addition of cystine had no effect.

Studies on the liberation of compounds in the folic acid group, T. D. LUCKEY, G. M. BRIGGS, JR., P. R. MOORE, C. A. ELVEHJEM, and E. B. HART. (Wis. Expt. Sta.). (*Jour. Biol. Chem.*, 161 (1945), No. 1, pp. 395-403, *illus.* 1).—Various substances were assayed for folic acid activity using *Streptococcus faecalis* and *Lactobacillus casei* as the test organisms. The substances tested were meats (ham, beef, kidney, liver, and liver powder), skim milk, yeast and yeast extract, beets, wheat, orange juice, various liver fractions, and grass juice powder. The substances were extracted by one or more of the following treatments: Takadiastase digestion at pH 4.5 for 24 hr. at 37° C.; enzymatic extraction with chicken pancreas at pH 8 for 24 hr. at 37°; other enzymes (clarase, papain, pepsin, pancreatin, ficin, and mylase P) at optimum pH for 24 hr. at 37°; hydrolysis at pH 4.0 for 12 hr. at 15 lb. pressure; alkaline hydrolysis in 2 N or 0.1 N base and autoclaved ½ to 1 hr. at 15 lb. pressure; and simple autolysis in water for 24 hr. at 37°.

The results were extremely variable depending upon the material being studied. Takadiastase digestion gave maximum values for most meats. The enzyme prepared from chicken pancreas worked well on certain materials such as Difco yeast extract. Autoclaving at pH 4 for 12 hr. under 15 lb. pressure gave the highest folic acid values for certain liver preparations.

Studies on the formation of folic acid by incubating *Lactobacillus casei* factor and pyracin with chick liver, L. J. DANIEL, M. L. SCOTT, L. C. NORRIS, and G. F. HEUSER. (Cornell Univ.). (*Jour. Biol. Chem.*, 160 (1945), No. 1, pp. 265-271).—This is a continuation of the studies of Scott et al. (*E. S. R.*, 93, p. 759) on the relationship between *L. casei* factor (LCF), pyracin (P), and folic acid (FA).

Incubation of LCF with fresh chick liver caused a marked increase in the FA content as measured by *Streptococcus lactis* R. If both LCF and P are incubated with the liver, the increase in FA content is nearly double that produced when liver is incubated with LCF alone. If α - or β -pyracin lactones replace P in the mixture in which LCF is incubated with liver, an inhibition in the synthesis of FA is noted.

The authors suggest that the action of pyracin in promoting an increased production of FA may be explained by conjugation with LCF to form FA, or by entering into an enzyme system that brings about the conversion of LCF to FA.

The use of charcoal treated peptone in microbiological assays, H. ISBELL. (*Science*, 102 (1945), No. 2661, pp. 671-672).—A modification is described for the simplification of the microbiological methods which use *Lactobacillus arabinosus* for the assay of biotin, pantothenic acid, and nicotinic acid.

Charcoal-treated peptone replaces the charcoal-treated casein hydrolysate. The peptone, dissolved in water, is acidified to pH 3.0 and treated with Darco G60 by being stirred for 1 hr. The solution is filtered by suction, and the acidification, charcoal treatment, and filtration of the solution are repeated. The volume is adjusted, and the solution preserved under toluene.

Tabulated results obtained by the casein and peptone methods show excellent agreement between the two procedures.

Note on the orcinol reagent, W. E. MILITZER. (Univ. Nebr.). (*Arch. Biochem.*, 9 (1946), No. 1, pp. 85-90, *illus.* 3).—After using this reagent successfully for several years in the student laboratory, the author encountered difficulties traced, in part, to impurities in the hydrochloric acid. Directions for

the preparation of the reagent in a form which will yield consistent results are given. It was found that the efficiency of the orcinol reagent for the identification of pentoses, pentosans, uronic acids, and polyuronides is dependent on the purity of reagents, the presence of sufficient ferric iron, and the dilution of the reaction mixture with butyl alcohol for observation. The absorption spectrum of the blue pigment in alcohol is characteristic for carbohydrates producing furfural and can be used for qualitative and quantitative work.

Determination of water in dry food materials—application of the Fischer volumetric method, C. M. JOHNSON. (U. S. D. A.). (*Indus. and Engin. Chem., Analyt. Ed.*, 17 (1945), No. 5, pp. 312–316, illus. 2).—The author considers the volumetric method developed by Fischer to be more rapid and specific for water than the vacuum-oven method usually used. A methanolic suspension or solution of the sample is titrated with a reagent composed of iodine and sulfur dioxide dissolved in pyridine and methyl alcohol.

A description is given of the procedures used in assaying samples of starch, sugars, pectin, dried eggs, and dehydrated vegetables and fruit powders. Vacuum-oven values, included for comparison, were found to run slightly lower than those obtained by electro-metric titration.

Tests were made to determine the effects of temperature, time, and particle size of the sample on the accuracy of the method. Certain organic compounds, notably *l*-ascorbic acid, aldehydic and ketonic compounds, inorganic oxides, and oxidizing-reducing agents, were found to interfere with results obtained by the Fischer method. As the amounts of these interfering substances likely to be present in food products are relatively small and would account for less than 0.1 percent of the apparent moisture, their influence on the accuracy of the results was considered to be minor.

Determination of moisture in peanut kernels, C. L. HOFFPAUIR. (U. S. D. A.). (*Oil & Soap*, 22 (1945), No. 11, pp. 283–286, illus. 5).—At a pressure of less than 5 mm., peanut material lost some oily distillate at 130° C. though little change in the oil was detected under moisture determination conditions. Losses in weight of 5- and 50-gm. samples of 19-tooth ground and 50-gm. whole kernel peanuts in fresh condition after 5 hr. at 130° in a forced draft oven showed excellent agreement. This was held to indicate that original moisture should be determined on whole kernels and second moisture on 19-tooth or similarly ground kernels by heating for 5 hr. in a forced draft oven at 130°. Some of the values indicated that heating for 3 hr. at 130° in a forced draft oven might be adequate for the second moisture determination. It is pointed out that the shorter heating of the ground sample would also reduce the possibility of oxidative decomposition of the small samples used for second moisture. These procedures are considered to provide conditions of drying which reduced both the first and second moistures to a basis of equal dehydration of the sample material. Errors due to changes in moisture content of peanut kernels during grinding for original moisture are held to be avoided. The methods described are considered to provide a basis for planning collaborative investigations on the procedures for the determination of moisture in peanut kernels for inspection and control purposes in the trade and processing industries.

The calculation of total solids by means of the Sharp and Hart equations, B. L. HERRINGTON. (Cornell Univ.). (*Jour. Dairy. Sci.*, 29 (1946), No. 2, pp. 87–89).—The author analyzes the equations set up by Hart and Sharp (*E. S. R.*, 76, p. 844) for the computation of the total solids of milk from its specific gravity and fat content to show the source of an error of about –0.75 percent

in the calculated value. The data upon which Sharp and Hart based their equations were obtained by means of a form of the Westphal balance, the specific gravity having been computed as the ratio of the weights of equal volumes of milk and water, both weighed at a temperature of 30° C., and these specific gravity data converted into Quevenne lactometer readings without correction for the difference due to the fact that the Quevenne instrument gives specific gravity readings relative to the density of water at 60° F. [15.56° C.]. Values of specific gravity at 30° C./30° C. must be, therefore, multiplied by 0.99663 to convert them to values at 30° C./60° F. It is further noted that when a Quevenne lactometer is used at 30° C. it does not indicate exactly the specific gravity referred to water at 60° F., because there is an appreciable expansion of the lactometer when it is warmed from 60° F. to 30° C. If one can assume that the value 0.00002648 given for the cubical coefficient of expansion of glass is applicable to the ordinary lactometer, than one can convert true values of specific gravity at 30° C./60° F. to apparent specific gravities as measured with a lactometer by multiplying by 1.00038. A form of the Sharp and Hart equation, incorporating the corrections noted, is given.

The microbiological determination of amino acids in animal proteins. S. W. HIER, C. E. GRAHAM, R. FREIDES, and D. KLEIN. (*Jour. Biol. Chem.*, 161 (1945), No. 2, pp. 705-716).—The *Lactobacillus arabinosus* technic of Shankman et al. (*E. S. R.*, 92, p. 4) was used for the assay of glutamic acid, leucine, isoleucine, valine, and threonine. Arginine, phenylalanine, and tyrosine were determined with *L. casei* following the procedures of McMahan and Snell (*E. S. R.*, 91, p. 633). Histidine and lysine were assayed with *Leuconostoc mesenteroides* using the improved medium of Dunn et al. (*E. S. R.*, 95, p. 14). The proteins to be assayed were hydrolyzed by refluxing 2-gm. samples with 80 cc. of 8 N HCl for 8 hr. in all glass equipment. The hydrolysate was then diluted, neutralized, and adjusted to 1 l. and filtered. Casein, beef fibrin, lactalbumin, gelatin, pork pancreas, beef muscle, crystalline bovine albumin, and beef serum were assayed for the ten amino acids mentioned. Evidence is presented of the reproducibility and of the validity of the values reported. Forty-three references are cited.

Microbiological determination of free leucine, isoleucine, valine, and threonine in dog plasma. S. W. HIER and O. BERGEIM. (*Univ. Ill. et al.*) (*Jour. Biol. Chem.*, 161 (1945), No. 2, pp. 717-722).—The *Lactobacillus arabinosus* procedure (described above) was applied to the determination of free leucine, isoleucine, valine, and threonine in plasma. Blood from 12 fasted mongrel dogs was used, and tungstic acid filtrates of the plasma were prepared.

Results showed the following values in micrograms per cubic centimeter of plasma: Leucine, 14.3 to 30.6; isoleucine, 8.7 to 19.5, threonine, 15.0 to 35.0; and valine, 15.2 to 30.3 γ /cc. "Five samples of dog plasma were found to contain less than 6.0 γ per cubic centimeter of glutamic acid. No differences in the free amino acid content of plasma were found in anesthetized animals as compared with unanesthetized animals."

Investigations of amino acids, peptides, and proteins.—XXI, The determination of histidine in protein hydrolysates with *Leuconostoc mesenteroides* P-60, M. S. DUNN, M. N. CAMIEN, S. SHANKMAN, and L. B. ROCKLAND. (*Univ. Calif. et al.*) (*Jour. Biol. Chem.*, 159 (1945), No. 3, pp. 653-662).—The microbiological method previously described (*E. S. R.*, 95, p. 14), using *L. mesenteroides* P-60 as the test organism, has been used in the assay of histidine. Samples of casein and silk fibroin gave histidine values of 3.1 and 0.34

percent, respectively. Preliminary studies were made on the precipitation of histidine, at pH 7.4, as a silver salt from a casein hydrolysate.

A discussion is included in which the results obtained here are evaluated in relation to values obtained by various other procedures. A list of 26 references is given.

Investigations of amino acids, peptides, and proteins, XXIII-XXV. (Univ. Calif.). (*Jour. Biol. Chem.*, 161 (1945), No. 2, pp. 643-678, illus. 28).

XXIII. *The determination of phenylalanine in protein hydrolysates with Leuconostoc mesenteroides P-60 and Lactobacillus casei*, M. S. Dunn, S. Shankman, and M. N. Camien (pp. 643-655).—Microbiological procedures using *Leuconostoc mesenteroides* P-60 and *Lactobacillus casei* as the test organisms have been adapted to the determination of phenylalanine in protein hydrolysates. Results in close agreement for the percentage of phenylalanine in casein and in silk fibroin were found by assays with these organisms. The corrected values of phenylalanine in casein and silk fibroin, respectively, were found to be 4.91 and 1.28 percent under the conditions considered to be most reliable.

It is considered probable that the true value for phenylalanine in casein is 5.0 ± 0.2 percent, as data of high accuracy were obtained in the recovery of phenylalanine from three amino acid test mixtures of different composition and from casein hydrolysates. This figure is in approximate agreement with the values obtained by investigators who employed what appeared to be dependable colorimetric procedures. The authors note, however, that the extent to which phenylalanine is destroyed or altered during the hydrolysis of casein must be measured before the true value for phenylalanine in this protein can be determined with certainty. A bibliography of 51 references is included.

XXIV. *The amino acid requirements of Lactobacillus fermenti 36*, M. S. Dunn, M. N. Camien, and S. Shankman (pp. 657-667).—The amino acid requirements of *L. fermenti* 36 were carefully studied. The growth response to glutamic acid, histidine, methionine, and threonine at different levels of total amino acids and the effect of histidine at different levels of NaCl, and KCl, equal mixtures of NaCl and KCl, NH_4Cl , glucose, sodium acetate, purines and pyrimidines, phosphate buffer salts, nonbuffer salts, and vitamins has been measured in terms of acid production. Results demonstrate that histidine and threonine, but not glutamic acid and methionine, are synthesized by *L. fermenti* 36 after 2 days' incubation under the described experimental conditions. The authors conclude that the basal medium and the experimental conditions established on the basis of the described experiments may be satisfactory for the determination of some amino acids with *L. fermenti* 36.

XXV. *The determination of histidine in protein hydrolysates with Lactobacillus fermenti 36*, M. S. Dunn, S. Shankman, and M. N. Camien (pp. 669-678).—The basal medium experimentally derived above (paper XXIV) has been specifically modified for the determination of histidine. Preferred assay conditions are described.

The assay of two samples of casein with *L. fermenti* 36 and *Leuconostoc mesenteroides* P-60 under varied experimental conditions indicates that casein contains 3.0 ± 0.1 percent of histidine corrected for moisture and ash. The authors emphasize, however, that the extent to which histidine is destroyed or altered during the hydrolysis of casein must be measured before the true value of histidine in this protein can be determined with certainty. The source and preparation of the casein samples may account for variations in the amino acid content.

Silk fibroin was found to contain 0.33 to 0.35 percent of histidine corrected for moisture and ash by assay with *Lactobacillus fermenti* 36 under varied experimental conditions. Experiments on the recovery of histidine from silk fibroin hydrolysates indicate that these values may be higher than the true figure.

A bioassay for lysine by use of a mutant of *Neurospora*, A. H. DOERMANN. (*Jour. Biol. Chem.*, 160 (1945), No. 1, pp. 95-103, illus. 1).—A method is described for the assay of lysine by the use of a mutant of *Neurospora crassa*. It was found necessary to remove all arginine from the material to be analyzed in order to obtain consistent results, as arginine inhibits the growth of this mutant. Arginine is hydrolyzed to ornithine by the use of a liver arginase preparation.

Over the assay range used, the results were found to be reproducible and good recoveries of added lysine were obtained. Lysine values for four protein hydrolysates obtained by this method were casein, 6.6-6.8 percent; ovalbumin, 6.3; gelatin, 6.9; and gluten, 1.3 percent.

The Kiliani reaction as a direct measure of reducing groups, W. E. MILITZER. (*Univ. Nebr.*). (*Arch. Biochem.*, 9 (1946), No. 1, pp. 91-94).—The author showed that the quantity of hydrogen cyanide consumed by a sugar in the Kiliani reaction can be determined by titrating the excess with silver nitrate in the presence of potassium iodide and ammonium hydroxide. Each sugar consumes cyanide in the ratio of 1 mole for each aldehyde, ketone, hemiacetal, or hemiketal group in the molecule. Various classes of sugars could be differentiated from one another on the basis of cyanide consumption. Hexoses were thus distinguished from pentoses and tetroses, and monosaccharides from disaccharides and trisaccharides.

Note on a biochemical method for determining crude fiber in corn meal, H. W. WOODSON and H. S. MACKENZIE. (*Univ. Ill.*). (*Cereal Chem.*, 22 (1945), No. 2, pp. 158-160).—The authors note that the determination of crude fiber, "which is the indigestible part of foodstuffs consisting of cellulose, non-water-soluble hemicelluloses, and lignin," is, as ordinarily carried out by boiling successively with 1.25 percent solutions of sulfuric acid and of sodium hydroxide, "probably one of the least accurate of all the analyses" made in the examination of foodstuffs. They developed a simplified enzymatic method which compares favorably with a more expensive and time-consuming enzymatic method. In the analysis of several samples of corn meal, their method gave the average figure 8.23 percent, the more elaborate enzymatic procedure yielding 8.76 percent. This method, as applied to corn meal, gave crude fiber values which were approximately four times as large as those obtained with the customary method. It is also believed that it can be satisfactorily used in the analysis of other cereals.

Degree of pigmentation and its probable relationship to invertive activity of honey, H. A. SCHUETTE and P. DUBROW. (*Univ. Wis.*). (*Food Res.*, 10 (1945), No. 4, pp. 330-333).—Invertive activity, measured by the change in the invert sugar content of a honey solution of controlled pH 6 hr. after the addition of sucrose, expressed as milligrams of sucrose hydrolyzed by 1 gm., appeared to bear a qualitative rather than a quantitative relationship to the degree of pigmentation (Pfund scale) of honey. Dark honeys were found to exceed the light ones in this property. By use of the photoelectric colorimeter and an adaptation of the Baier-Neumann test for added sugar in milk, the following average values were found: For the light honeys (water-white, white, and extra light amber) 27; for the dark honeys (light amber, amber, and dark) 132.

Some factors which affect the determination of oil in soybeans, F. I. COLLINS and O. A. KROBER. (U. S. D. A. coop. 24 expt. stas.). (*Oil & Soap*, 22 (1945), No. 11, pp. 307-310, illus. 3).—Preparation of the sample by a very fine grinding, such as that obtained by the use of a mill of one of three specified commercial makes, was found essential to an increased oil extraction in the official A. O. C. S. method of analysis. It is believed that much of the increase of 0.2-0.4 percent of oil obtained by regrinding very finely ground soybean meals which has been attributed to reduction in particle size is probably caused by the gain of 3.5 percent in moisture content of the meal due to high humidity at the time of regrinding. The authors' results are held to indicate that by a very fine initial grinding better reproducibility of analyses might be obtained if the regrinding were omitted or the samples exposed for 30 to 50 min. at controlled relative humidity during the regrinding period. Time and technic of exposure of the samples at their regrinding may have caused variations as great as 0.2 percent in oil analyses. The percentage of oil obtained in the last 2 hr. in using the official A. O. C. S. method of oil analysis on finely ground samples was seldom greater than 0.02 percent. Raising to 30° C. the temperature of the cold water which was supplied to the condensers of the oil extraction apparatus prevented condensing of atmospheric moisture without affecting the percentages of oil obtained in the analyses. The heat treatment of soybeans to predry them before their initial fine grinding did not affect appreciably either the Wijs iodine number or the refractive index of the oil which is extracted with petroleum ether.

Estimation of salt in butter and new cheese by a mercurimetric method, W. S. ARBUCKLE. (Tex. Expt. Sta.). (*Natl. Butter and Cheese Jour.*, 37 (1946), No. 5, pp. 41-42, 44).—The author proposes to determine the chlorides from butter and cheese samples by titration of their aqueous solutions with a standard mercuric nitrate solution in the presence of *s*-diphenylcarbazone as internal indicator. As applied to butter, the method directs dissolving the residue from the fat and moisture determinations made upon a 10-gm. sample in 250 cc. of water. Of the resulting solution, an aliquot of 25 cc. is to be titrated with 0.1711 N mercuric nitrate made up to contain 40 cc. of 2 N nitric acid in each liter, the added indicator being 0.6 cc. of a solution of 100 mg. of *s*-diphenylcarbazone in 100 cc. of neutral ethyl alcohol. The clear and colorless solution turns a pale violet color on the addition of 1 drop of mercuric nitrate at the end point and an intense violet-blue color on the addition of 1 drop of mercuric nitrate in excess. The cubic centimeters of 0.1711 N mercuric nitrate used in the titration equal the percentage salt in the sample. In solutions containing protein, the color appearing on addition of the indicator was at first "salmon red," changing to violet at the beginning of the titration. With further addition of the mercuric salt, the initially turbid protein solution became clear and either colorless or pale yellow. These changes were followed by the end point change to pale violet. In cheese samples, the chloride content was similarly determined, save that the 10-gm. sample was made up to an aqueous suspension, the suspension heated to 150°-160° F., and cooled to room temperature. Aliquots of the clear solution were titrated as above. The mercuric nitrate solution having been adjusted to 0.1711 N by titration against a standard solution of pure sodium chloride, the volume of the titrant used in cubic centimeters gave the percentage of salt in the sample directly. The method was found accurate, and, as compared with silver nitrate titration with potassium chromate as indicator, to be somewhat more sensitive and to have the advantage of a sharp, permanent end point. On the other hand, "the method does not seem to be adaptable to procedures requir-

ing digestion of the sample, and no satisfactory procedure was found for using the mercurimetric method as a direct titration procedure for determining the chloride content of milk nor for determining the chloride content of chlorine sterilizers used in the dairy industry."

Detection of raw milk contamination in homogenized milk by means of the phosphatase test and by organoleptic examination, A. V. MOORE and G. M. TROUT (*Michigan Sta. Quart. Bul.*, 28 (1946), No. 4, pp. 311-316).—Observations with respect to development of rancidity, titratable acidity, pH, and phosphatase tests were made on five series of homogenized and nonhomogenized milk to which various increments of raw milk had been added. During storage at 40° F. raw milk-contaminated homogenized milk increased in titratable acidity, decreased in pH, and developed rancidity. The contamination could be detected positively by the phosphatase test when 0.5 percent raw milk was added, questionably when 0.1 percent was added, but not when 0.05 percent was added. The level of contamination detectable by organoleptic examination depended largely upon the length of the storage period. "In general, at 24 hours' storage, contamination of homogenized milk with raw milk must be at least 4 percent before rancidity can be detected by taste and smell. In no case could organoleptic examination detect the addition of 0.1 percent raw milk when mixtures were held 7 days at 40°. Extracting the phenol with butyl alcohol should be a required step, and not optional in the phosphatase test, particularly when applied to homogenized milk."

Assay of *p*-aminobenzoic acid, D. PENNINGTON (*Science*, 103 (1946), No. 2674, p. 397).—A method very similar to that described by Lewis (E. S. R., 89, p. 412) is described briefly. *Leuconostoc mesenteroides* Pd-60 is the test organism. Assay tubes are incubated at 37° C. for 15 hr. Maximum growth is produced by 0.1 μ g. of *p*-aminobenzoic acid per millimeter of medium, and growth is measured turbidmetrically. Samples are prepared for assay by autoclaving 1 gm. of sample with 5 cc. of 6 N H₂SO₄ at 15 lb. pressure for 15 min. The samples are neutralized with Ba(OH)₂, diluted to an approximate volume, and filtered. Hot water extraction or enzyme hydrolysis liberated only a fraction of the total vitamin present. Alkaline hydrolysis caused heavy destruction of the activity of tissue extracts.

Modifications in the *Acetobacter suboxydans* assay for *p*-aminobenzoic acid, V. H. CHELDELIN and M. J. BENNETT. (Oreg. State Col.). (*Jour. Biol. Chem.*, 161 (1945), No. 2, p. 751).—The medium developed by Sarett and Cheldelin (E. S. R., 94, p. 429) for the determination of the lactone moiety of pantothenic acid has been found useful in the assay of *p*-aminobenzoic acid. The β -alanine and *p*-aminobenzoic acid in the medium are replaced by 200 γ calcium pantothenate per liter. Results at various levels were found to be in good agreement.

Methods of estimating and the effect of variety and protein level on the baking absorption of flour, K. F. FINNEY. (Kans. Expt. Sta. coop. U. S. D. A. and State expt. stas.). (*Cereal Chem.*, 22 (1945), No. 2, pp. 149-158, illus. 2).—A study of absorption in baking indicated that variations of 2 percent plus or minus the optimum did not significantly alter loaf volumes or grain and texture scores. Absorption determinations could be replicated from one day to the next within limits of about 0.5 percent. In experiments on flours of 10 pure hard winter wheat varieties grown in widely different environments, absorption was observed to be essentially a linear function of protein content within a variety. However, each variety seemed to have a different regression line, the slope of which, in general, increased as the absorption level became greater. The increase in absorption per percent of pro-

tein varied from about 1 percent to slightly more than 2 percent. The level of absorption at 16 percent protein varied from 63 to over 73 percent, which difference was several times that regarded as being necessary for statistical significance. Regression lines for several varieties were established and successfully used for estimating absorptions in experimental baking since 1939.

Nutritive value of canned foods, [XI-XII]. (Pa. State Col. et al.). (*Indus. and Engin. Chem., Analyt. Ed.*, 17 (1945), Nos. 8, p. 531; 11, pp. 710-713).—This is a continuation of the series of studies on the nutritive value of canned foods (E. S. R., 94, p. 547).

[XI]. *Comparison of vitamin values obtained by different methods of assay*, N. B. Guerrant, M. G. Vavich, and O. B. Fardig (pp. 710-713).—Six representative foods—carrots, corn, ham, peas, salmon, and tomatoes—were prepared as purees or homogenized to insure uniformity of composition. The products were processed by commercial methods in tin containers. Assays for ascorbic acid, carotene (or vitamin A), thiamine, riboflavin, pantothenic acid, and niacin were carried out by several collaborating laboratories and by one or more of the recommended procedures—biological, chemical, fluorometric, photocolorimetric, or microbiological.

Results are tabulated and show considerable variation between laboratories.

The authors conclude that, from the information available, the use of different standards, methods, or equipment cannot be considered the major factor in the discrepancies noted. "It appears that the human element is, perhaps, one of the most significant sources of variable results. . . ." The need for more collaborative assays under vigorously controlled conditions is emphasized.

[XII]. *Determination of ascorbic acid of fresh green peas*, M. G. Vavich, R. M. Stern, and N. B. Guerrant (p. 531).—Reduced ascorbic acid was determined on samples of fresh green peas by the indophenol-titration method. Blending of the sample with 3 percent metaphosphoric acid in ratios of 2 : 1 or 1 : 1, respectively, produced a loss of ascorbic acid which amounted to as much as 97.3 percent in certain cases. The blending of the sample in an atmosphere of nitrogen instead of air materially reduced this loss. By raising the initial concentration of metaphosphoric acid to 6 percent so that the final concentration in the blended mixture was 3 percent of metaphosphoric acid, loss of ascorbic acid was reduced to zero.

Colorimetric determination of vitamin A, A. L. FEINSTEIN. (U. S. D. A.). (*Jour. Biol. Chem.*, 159 (1945), No. 2, pp. 569-570).—A preliminary note is presented describing a new colorimetric method for the assay of vitamin A.

Vitamin A oil or ground multivitamin tablets are extracted with chloroform so as to average 600 to 3,000 U. S. P. units per 10 cc. of solution. The chloroform extract is treated with two drops of concentrated HCl followed by 5 cc. of glycerol diochlorohydrin, and then shaken for 5 min. The clear blue-green color which appears in about 30 min. is read in a photoelectric colorimeter (660 $m\mu$ filter).

Vitamin A in the extract is estimated by comparison with a standard vitamin A reference curve determined spectrophotometrically.

Depending upon the lot of dichlorohydrin used, the blue-green color produced is stable for variable lengths of time (3 to 24 hr.). However, if standard reference curves and an unknown sample are run simultaneously, results read after 18 hr. are comparable with those obtained after 30 min.

The use of HCl produces four density peaks when the Beckman spectrophotometer is used and 20 $m\mu$ intervals are read. These peaks occur at approximately 440, 580, 640, and 740 $m\mu$, while a deep minimum density occurs at 500 $m\mu$.

Spectrophotometric study of a new colorimetric reaction of vitamin A. A. E. SOBEL and H. WERBIN (*Jour. Biol. Chem.*, 159. (1945), No. 3, pp. 681-691, illus. 6).—A new reagent, glycerol, 1,3-dichlorohydrin (GDH), has been used in the colorimetric estimation of vitamin A. Its advantages over other methods are: (1) Stability of color produced, permitting measurements from 2 to 10 min. after the reagents are mixed; and (2) the reagent employed is stable and unaffected by traces of moisture. The one disadvantage is that the extinction coefficient of the color produced is only about one-quarter that of the antimony trichloride blue color.

Spectrophotometric data are presented for the transient blue color produced immediately after the solutions are mixed and for the secondary violet color which is the stable product of the reaction of the reagent with vitamin A. The effect of carotene upon the color formation and its interference with the determination of vitamin A by the reagent was also investigated.

Tabulated results are presented comparing the values obtained by several methods for the various vitamin A concentrates studied.

Estimation of riboflavin, thiamine, and N¹-methylnicotinamide—rapid field methods. R. E. JOHNSON, F. SARGENT, P. F. ROBINSON, and F. C. CONSOLAZIO (*Indus. and Engin. Chem., Analyt. Ed.*, 17 (1945), No. 6, pp. 384-386).—By modifications and simplifications of existing methods, the authors have worked out a rapid field technic for vitamin assay of small volumes of urine.

The riboflavin analysis is based upon the method of Najjar (E. S. R., 87, p. 621). The thiochrome method of Hennessy and Cerecedo (E. S. R., 82, p. 588) as modified by Egaña and Meiklejohn (E. S. R., 87, p. 620) is used to determine thiamine, in conjunction with the Najjar and Wood method (E. S. R., 85, p. 702) for the determination of N¹-methylnicotinamide. Visual fluorometry and simple rugged apparatus are employed. The authors estimate that by their technic, four technicians can run duplicate analyses of all three vitamins on 100 specimens of urine in two working days.

Comparative merits of fasting specimens, random specimens, and oral loading tests in field nutritional surveys. R. E. JOHNSON, C. HENDERSON, P. F. ROBINSON, and F. C. CONSOLAZIO (*Jour. Nutr.*, 30 (1945), No. 2, pp. 89-98, illus. 1).—Tests were made under field conditions on groups of men subsisting on good rations (combat rations). Riboflavin, thiamine, and N¹-methylnicotinamide assays were carried out by the simplified technics described above. Analyses of urinary excretion were made on fasting specimens, 4 hr. after a test dose of vitamins, and on random specimens taken throughout the day. Assays included blood hemoglobin, serum protein, serum and urinary chloride, and serum and urinary ascorbic acid. From the results of these tests, the authors conclude that for nutritional surveys "when it is not possible to conduct all the tests that might be desired, fasting levels should be determined in preference to the results of loading tests; that specimens of blood may with reservations be drawn at any time of day; and that random specimens of postprandial urine should be avoided if possible. These conclusions are limited to hemoglobin, serum protein, chloride, and ascorbic acid; and to urinary chloride, ascorbic acid, thiamine, N¹-methylnicotinamide, and riboflavin."

The microbiological assay of vitamin B₆ conjugate. O. D. BIRD, B. BRESSLER, R. A. BROWN, C. J. CAMPBELL, and A. D. EMMETT (*Jour. Biol. Chem.*, 159 (1945), No. 3, pp. 631-636).—A procedure is described for the microbiological assay of vitamin B₆ using *Lactobacillus casei* and a modification of the folic acid method of Mitchell and Snell.²

²Tex. Univ. Pub. 4137 (1941), pp. 36-37, illus. 1.

In the yeast and liver extracts and concentrates tested, vitamin B₆ was found to exist primarily in the bound or inactive form. Enzymatic liberation of the vitamin was accomplished by treatment with preparations obtained from desiccated hog kidney, extract of fresh and autolyzed hog kidney, and extracts of whole almond or almond meal.

When the natural materials and concentrates were enzyme-treated, the microbiological assay values obtained in most cases were in good agreement with chick antianemia assays. One exception was found with plant extracts (asparagus juice concentrate), in which none of the enzyme preparations used were able to insure a microbiological assay value equal to that obtained with chicks.

The multiple nature of vitamin B₆: Critique of methods for the determination of the complex and its components, D. MELNICK, M. HOCHBERG, H. W. HIMES, and B. L. OSER (*Jour. Biol. Chem.*, 160 (1945), No. 1, pp. 1-14, *illus.* 1).—Physical, chemical, microbiological, and biological assay procedures were compared in a critical study of the B₆ activity of biological materials and pure compounds of pyridoxine (1), pyridoxamine (2), and pyridoxal (3).

The ultraviolet absorption curves for pure solutions of the three compounds were made at widely separated pH intervals. Results indicated that (2) and (3) show features of amphoterism similar to that of (1).

An adaptation of the colorimetric procedure (E. S. R., 94, p. 299), by reducing the pH of the reaction and extending the reaction, time allows specific determination of pyridoxine in the presence of the derivatives. Pyridoxine couples with borate and is rendered nonreactive, whereas pyridoxal and pyridoxamine still react with the chloroimide reagent.

Microbiological assays with *Saccharomyces cerevisiae* give low vitamin B₆ values because the biologically active pyridoxine derivatives are appreciably less stimulatory for this organism. These derivatives, however, show comparable activity for *S. carlsbergensis* and for the rat.

The spectrophotometric, chemical, and microbiological data demonstrate that pyridoxine, pyridoxal, and pyridoxamine are all stable to the various hydrolytic procedures used in preparing the samples for assay.

Comparable results by both rat and microbiological assay (with *S. carlsbergensis*) were obtained for all three compounds and for an unidentified labile factor from yeast.

The authors consider the *S. carlsbergensis* method of Atkin et al. (E. S. R., 90, p. 9) to be the most reliable for the assay of all natural materials. For the assay of pharmaceutical preparations, the chemical method is recommended for its rapidity and simplicity. The advantages and difficulties of each method are discussed. Thirty references are cited.

The determination of oxybiotin in the presence of biotin, K. HOFMANN and T. WINNICK (*Jour. Biol. Chem.*, 160 (1945), No. 2, pp. 449-453, *illus.* 1).—"A procedure has been developed for the determination of oxybiotin in biological materials. The method is based upon the destruction of biotin by dilute potassium permanganate solution and the stability of oxybiotin toward this reagent. The yeast growth-stimulating activity of acid hydrolysates of tissues or micro-organisms following treatment with permanganate appears to be representative of their oxybiotin content.

"This new method has been used to demonstrate that *Saccharomyces cerevisiae* and *Rhizobium trifolii* grown in the presence of oxybiotin utilize this compound as such, and do not convert it into biotin. These results are the first demonstration that the sulfur atom is not essential for the biological activity of biotin."

The determination of thiamine in urine by means of the thiochrome technique, O. MICKELSEN, H. CONDIFF, and A. KEYS. (Univ. Minn.). (*Jour. Biol. Chem.*, 160 (1945), No. 1, pp. 361-370, illus. 1).—A modified thiochrome method is described which has been found to be particularly useful with urine samples which have low thiamine values and high blanks due to interfering substances. The principal features of the method are: (1) The use of small samples of urine (5 cc.) and (2) the treatment of the KCl-HCl solution with NaOH and potassium ferricyanide, followed by a mixture of HCl and H₃PO₄ to obtain a pH of 8.0 to 9.5 before the addition of the isobutanol.

At this pH, the fluorescence produced by interfering substance is minimum and that produced by thiochrome is optimal. The authors conclude from the results obtained that "the present method never yields negative values, allows satisfactory recovery of added thiamine, and produces theoretical results in mixtures which have been separately analyzed. Previous thiochrome methods fail in these particulars with urines from persons on very low thiamine intakes."

Statistical evaluation of the method gave a standard deviation of 4.6 percent of the mean.

The method yields higher values for urine especially in cases of thiamine deficiency. Diet and food items tested gave essentially the same values with all methods tested.

A reaction of ascorbic acid with α -amino acids, T. KOPPANYI, A. E. VIVINO, and F. P. VEITCH, JR. (*Science*, 101 (1945), No. 2630, pp. 541-542).—A new colorimetric test for the determination of ascorbic acid is described. It has been found to give negative results when tested with other reducing substances, ketones, phenols, or carbohydrates such as sorbitol, glucose, fructose, mannose, xylose, trehalose, arabinose, starches, and *d*-glucurone. When *dl*-alanine and H₂O₂ are added to ascorbic acid, and the mixture heated and then cooled, a red color appears. The authors consider this color to be developed by dehydroascorbic acid in a manner similar to the ninhydrine or murexide tests. The use of glacial acetic acid increases the sensitivity of the reaction. A discussion is presented of the possible chemical interaction produced.

The indophenol-xylene extraction method for ascorbic acid and modifications for interfering substances, W. B. ROBINSON and E. STOTZ. (N. Y. State Expt. Sta.). (*Jour. Biol. Chem.*, 160 (1945), No. 1, pp. 217-225).—Modifications in Stotz's (*E. S. R.*, 88, p. 153) and Pepkowitz's (*E. S. R.*, 92, p. 10) indophenol-xylene methods for the determination of ascorbic acid have resulted in an improved procedure with increased specificity. Peroxide treatment is advocated to eliminate interference when sulfite, iron, or tin is present in any of the samples, while a formaldehyde treatment successfully eliminates the interference produced by reductones and related compounds.

Interference due to some sulfhydryl and quinol compounds has been tested. Pyrogallol and hydroquinone at a 10 : 1 molar ratio with ascorbic acid were found to give 25 to 50 percent increases in the ascorbic acid values obtained. No method of correcting the error due to these substances has been elaborated.

The determination of ascorbic acid in small amounts of blood serum, O. H. LOWRY, J. A. LOPEZ, and O. A. BESSEY (*Jour. Biol. Chem.*, 160 (1945), No. 2, pp. 609-615).—Modifications in the dinitrophenylhydrazine method of Roe and Kuether (*E. S. R.*, 90, p. 297) have been worked out to permit the determination of ascorbic acid in 0.01 cc. of serum. Small amounts of blood are collected according to the procedure of Lowry and Hunter (*E. S. R.*, 94, n. 423).

Values obtained were found to be in good agreement with those obtained by the macroindophenol method of Mindlin and Butler (E. S. R., 80, p. 728). The described micromethod is considered particularly suitable for nutritional surveys because of (1) the ease of obtaining suitable blood specimens, (2) the stability of the specimens, and (3) the convenience for large-scale analytical operations.

Determination of vitamin C in the presence of interfering reducing substances—selective oxidation-reduction method, A. P. STEWART, JR., and P. F. SHARP (*Indus. and Engin. Chem., Analyt. Ed.*, 17 (1945), No. 6, pp. 373-376, illus. 1).—The analysis of true vitamin C is based upon the use of selective oxidation and reduction procedures carried out under well-defined conditions of pH, time, and temperature.

Ascorbic acid and interfering reducing substances are catalytically oxidized by the addition of concentrated (12 : 1) cucumber juice. Specific reduction of all dehydroascorbic acid to ascorbic acid is obtained by treatment with a suspension of *Escherichia coli* or *Staphylococcus albus*. This ascorbic acid is derived from the dehydroascorbic acid produced by the action of the cucumber oxidase and from any preformed dehydroascorbic acid present in the sample. The indophenol dye titration method is used to measure the total vitamin C present. Assays have been made on canned orange, grapefruit, pineapple, apple, parsley, lettuce, and sauerkraut juice; fresh, evaporated, and dried milk; and blood and urine. A high proportion of interfering reducing substances was found in urine, evaporated milk and parsley, lettuce and sauerkraut juice.

The chemical determination of tocopherols in animal fats: The stability of hog fats in relation to fatty acid composition and tocopherol contents, J. R. CHIPAULT, W. O. LUNDBERG, and G. O. BURR. (Univ. Minn.). (*Arch. Biochem.*, 8 (1945), No. 2, pp. 321-335, illus. 3).—The authors point out that the red orthoquinones produced by the nitric acid oxidation of tocopherols have only a moderate intensity of color, and that other substances often present in fats yield oxidation products of which the absorption spectra are such as to interfere with a simple colorimetric determination of tocopherols by this means. Oxidizing the unsaponifiable matter from the extracted fat with nitric acid and separating the red orthoquinones by means of an alumina adsorption column improved the specificity greatly but did not improve the sensitivity. The authors therefore added the further modification of bringing the purified orthoquinones into reaction with the leuco reduction product of methylene blue, prepared and used out of contact with atmospheric oxygen, and determining colorimetrically the dye regenerated by the oxidizing action of the quinones. A great increase in sensitivity was thus obtained, and the small quantities of tocopherols present in animal fats could be measured.

The method was applied to the measurement of tocopherols in hog fats. Evidence obtained indicated that tocopherol concentrations in several fats from the same hog are quite similar, but that the contents of the same fats in different hogs may vary widely. All of the values for several fats from two hogs were considerably greater than a single value previously reported. It was found that, in general, the keeping qualities of carefully processed hog fats are dependent primarily on two factors, their linoleic acid and tocopherol contents. It is concluded that tocopherols are the only natural direct inhibitors of oxidation present appreciably in normal hogs and that the tocopherols are probably derived solely from the diet.

A simplified hydrogenation technique for the determination of blood plasma tocopherols, M. L. QUAIFFE and R. BIEHLER (*Jour. Biol. Chem.*, 159 (1945),

No. 3, pp. 663-665, illus. 2).—A simplification of the Quaife and Harris method (E. S. R., 93, p. 680) for the analysis of vitamin E in plasma is reported. By the use of a semimicrohydrogenation apparatus, which is described in detail, analysis of vitamin E can be made in 30 min. Illustrations and suggestions are given for the application of the apparatus to general laboratory hydrogenation.

AGRICULTURAL METEOROLOGY

The design and analysis of methods for sampling microclimatic factors, H. G. WILM. (U. S. D. A.). (*Jour. Amer. Statis. Assoc.*, 41 (1946), No. 234, pp. 221-232).—"The purpose of this paper is to outline the principles and use of a method for sampling factors—such as the amount of rain reaching the ground under a forest during a series of storms—which exhibit variations in both space and time. Solutions of two somewhat different sampling problems are discussed. One is designed simply to provide a sample estimate (average or sum) for any desired factor over a period of time. The other, with little loss of efficiency, provides a sample estimate for each of a series of short-time units making up the period, as well as an estimate for the period as a whole. It is shown that these sampling methods are likely to supply a substantial gain in efficiency as compared to methods that have been commonly employed."

The glacial anticyclone theory examined in the light of recent meteorological data from Greenland, I. F. E. MATTHES (*Amer. Geophys. Union Trans.*, 27 (1946), No. 3, pp. 324-341, illus. 3).—The glacial anticyclone theory is today still the only definitely formulated theory concerning the atmospheric movements occurring over an ice sheet of large extent. In this paper the author first analyzes the theory and then presents the facts of observation now at hand—especially those reported from the fixed meteorological stations maintained in the interior of Greenland during the 1930's. In this, the first part of the paper, the meteorological data from Eismitte station of the German Wegener expedition are reviewed; the second part is to cover the aerological data of that expedition and similar material from other ice-cap stations. The conclusions reached are that there is now no evidence of a virtually permanent "glacial anticyclone" centered over the Greenland ice sheet; on the contrary, there is consistent evidence from all parts of Greenland that the weather over the ice sheet is controlled by alternating cyclonic and anticyclonic movements. Cyclonic activity is most intense in southern and weakest in northern Greenland. The entire ice sheet is supplied with snow brought by rising maritime masses, not by air descending from the upper troposphere. There is not so much as a 50 : 50 chance of meeting good weather over central Greenland, except for a few weeks in midsummer.

Regional contrasts in hot degree-day units in the United States, S. S. VISHNER (*Amer. Geophys. Union Trans.*, 27 (1946), No. 3, pp. 348-349, illus. 5).—The maps presented—based on official data—reveal sharp contrasts in the intensity and duration of high temperatures and in the need for artificial house cooling if maximum comfort and intellectual activity are to be attained.

The Hale double solar-cycle rainfall variation in western Canada, S. HANZLIK (*Amer. Met. Soc. Bul.*, 27 (1946), No. 5, pp. 249-250).—A brief note.

Experimental maximeters for wind speed, R. L. IVES (*Amer. Met. Soc. Bul.*, 27 (1946), No. 5, pp. 224-228, illus. 4).—It is concluded from the experiments reported that maximeters for station use, designed to operate from a standard anemometer, are relatively expensive and complicated. The follower

type seems mechanically and electrically superior to the direct ratchet type and is less costly in the long run. Cascading of stepping switches to produce a maximeter composed only of stock switches is a useful expedient but does not appear practicable for station use. Work here reported indicates that the follower type is the best to date, but suggests that some new principle—not here covered—may lead to the final answer.

Further remarks on early uses of punched cards in meteorology and climatology, L. W. POLLAK (*Amer. Met. Soc. Bul.*, 27 (1946), No. 5, pp. 195-199).—Some comments, with brief summaries of further meteorological and geophysical papers the results of which have been derived by the punched-card method and which were not mentioned in George's article (*E. S. R.*, 93, p. 250).

Our changing climate, J. B. KINCER (*Amer. Geophys. Union Trans.*, 27 (1946), No. 3, pp. 342-347, illus. 9).—In a previous paper (*E. S. R.*, 70, p. 744), the author discussed long-time temperature trends and presented data showing that an unusual and extended warm phase of climate had at that time developed through a more or less regular rise in temperature for a comparatively long period of years. Up to the end of 1945, records for 13 subsequent years have become available. These are here presented, supplementary to the original data, to determine the tendencies since 1932; they show that the general upward trend continued for several years, but that the more recent records reveal a leveling off and even contain currently a suggestion of an impending reversal. The detailed data are presented and summarized graphically in nine figures.

The climate of Arizona, H. V. SMITH (*Arizona Sta. Bul.* 197 (1945), pp. 112+, illus. 14).—In 1930 a compilation of weather records for the State was published (*E. S. R.*, 63, p. 416); at that time there were about 90 co-operative stations assisting the U. S. Weather Bureau in recording observations for the area. The present contribution reports figures ending in 1940 from over 175 cooperative Arizona stations and values from over 40 stations established since that date. The principal factors influencing the State's climate are latitude, altitude, interfering mountain ranges, and remoteness from any large body of water. The textual matter (pp. 1-32) includes discussions of the climate, temperature, length of growing season, precipitation over the State, at the university, and at 222 stations, rainfall intensity records, snowfall, relative humidity, sunshine, wind, evaporation climate in relation to comfort, health, and agriculture, and irrigated agriculture. The balance of the bulletin is taken up with some 27 tables presenting detailed statistics of all phases of Arizona weather and climate.

Climates of Texas, R. J. RUSSELL. (*La. State Univ.*). (*Tex. Geog. Mag.*, 9 (1945), No. 2, pp. 16-27, illus. 2).—Noted from another source (*E. S. R.*, 93, p. 681).

Weather injuries to fruits and fruit trees, A. B. GROVES (*Virginia Sta. Bul.* 390 (1946), pp. 39, illus. 15).—The weather conditions most commonly responsible for tree and fruit damage are the extremes of temperature and rainfall, and frost, hail, and wind. The principal types of damage caused by unfavorable weather are here discussed and illustrated in an attempt to aid fruit growers in recognizing such injuries as they occur under Virginia conditions.

North Atlantic hurricanes and tropical disturbances of 1945, H. C. SUMNER (*Mo. Weather Rev.* [*U. S.*], 74 (1946), No. 1, pp. 1-5, illus. 1).—The author presents reviews of all North American hurricanes and tropical disturbances—10 in number—that occurred during the 1945 season, a tabulated synopsis of their important features, and their tracks as plotted on a chart.

The evolution of rain, W. J. HUMPHREYS (*Jour. Franklin Inst.*, 241 (1946), No. 6, pp. 391-396).—"To most of us, perhaps, the way nature produces a shower of rain may seem to be too obvious to merit a second thought." The purpose of this article is to explain the evolution of rain and to show why the number of its drops is so small in comparison with that of the condensation nuclei in the lower free air.

Precipitation in Tennessee River Basin, annual 1945 ([*Washington 25, D. C.*]: *Tenn. Valley Authority*, [1946], pp. 38+, illus. 17).—Detailed statistical data—including maps showing precipitation for the year and by months—are presented.

Monthly Weather Review [January-March 1946] (*Mo. Weather Rev.* [U. S.], 74 (1946), Nos. 1, pp. 23, illus. 12; 2, pp. 25-42, illus. 11; 3, pp. 43-61, illus. 11).—In addition to meteorological, climatological, solar radiation, and sunspot data in each number, No. 1 contains an article noted on page 629.

Applications of climatology to building construction and agriculture, C. F. SARLE (*Amer. Met. Soc. Bul.*, 27 (1946), No. 5, pp. 210-215).—Under the stimulus of war an aggressive attitude on the part of climatologists became necessary; the new climatology has come to grips with the practical operating problems requiring climatic information for solution. The author discusses the applications to building construction and to agriculture. During the 1930's there were two distinct developments in the latter field that emphasized the trend away from broad generalizations and superficial methods: One was the interest in microclimatology and the other the establishment of field-plot experiments for determining the effects of weather on the growth and yield of such crops as cotton, corn, winter and spring wheat, and tobacco. Further discussion considers climatology in relation to farm management, land utilization, and the planning of agricultural experimental programs. Finally, a program is presented for the development of agricultural climatology which involves a close cooperation between the U. S. Weather Bureau and the agricultural colleges and experiment stations; "each has what the other needs."

SOILS — FERTILIZERS

Forest soils and forest growth, S. A. WILDE (*Waltham, Mass.: Chron. Bot. Co.*, 1946, pp. 241+, illus. 45).—This book originated from material used for student instruction, including graduates and upper classmen in soils, forestry, botany, game management, and landscape architecture. The subject of forest soils is treated broadly and in relation to contributions from soil science and forestry. Special attention is directed to the genetic soil groups of the world in relation to natural acclimatizational units. The scope of the subject matter presented is indicated by the following chapter headings: Historical and introductory; genesis of forest soils; genetic soil groups of the world—upland soils and hydromorphic and embryonic soils; forest cover—its biological structure and its relation to environment; physical properties, chemical properties, and organisms of forest soils; forest humus; soil-forest types; forest soil survey; soils and tree planting; amelioration of forest soils; silvicultural cuttings in relation to soils; productivity of forest soil and forest management; establishment of forest nurseries and control of nursery watering; use of commercial fertilizers and lime, composts, liquid fertilizers, and green manure crops in forest nurseries; adjustment of nursery soil fertility; and control of parasitic organisms in soils of forest nurseries. A considerable volume of reference material is presented.

Investigations in erosion control and reclamation of eroded sandy clay lands of Texas, Arkansas, and Louisiana at the conservation experiment station, Tyler, Tex., 1931-40, J. B. POPE, J. C. ARCHER, P. R. JOHNSON, A. G. MCCALL, and F. G. BELL. (Coop. Tex. Expt. Sta.). (U. S. Dept. Agr., Tech. Bul. 916 (1946), pp. 76+, illus. 20).—This continues a series of bulletins presenting the results from soil conservation experiment stations (E. S. R., 93, p. 401). Results of 10 yr. of research relating to soil and water conservation in the Texas-Arkansas-Louisiana Sandy Lands region on the effect of such factors as rainfall characteristics, soil series, slope, plant cover, cropping systems, strip cropping, terracing, and land use on soil and water losses are reported.

The results have shown that erosion control can be obtained on erodible lands of the region if they are placed under permanent cover of grass or forest. Sloping, intensively cultivated fields, on the other hand, require not only the use of improved rotations and protective winter cover crops but the additional support of terraces. This condition will hold true as long as the prevailing agriculture of the region remains primarily one of growing cotton, corn, and truck crops that require intensive cultivation, which is conducive to soil erosion. The need for terracing and terrace maintenance in the area will make the progress of erosion control slower than if purely vegetative control measures could be used. Subsoils erode more rapidly than the normal topsoils when planted to clean-tilled crops. As the soil becomes thinner the rate of erosion increases, which indicates the need for more intense erosion-control measures on the thinner soils. The Nacogdoches soil is less erodible than the Kirvin series under the same crop and cultural treatments and as a general rule is more productive. Increasing the slope gradient from 8.75 to 16.5 percent increased the soil loss 2.5 times. The kind of crop to be grown determines largely the degree of slope which may be used without excessive soil losses. In general, the utilization of steep slopes should be confined to perennial crops having a high degree of erosion resistance.

Complete control of erosion was not obtained from contour tillage, crop rotations, winter cover crops, or strip cropping alone or in combination, although marked reductions in soil losses were obtained as compared with those on the check area. Strip cropping reduced soil losses but did not furnish protection adequate for continued cropping of the field. The crop grown and the width and location of the strip are important factors in the successful use of strip cropping. When used in combination with terraces, strip cropping helped to reduce soil loss where the strip was located immediately above and including the terrace channel. Soil losses from terraces having grades exceeding 3 in. per 100 ft. were excessive. Terraces occupying fields having a deep, porous soil may be laid out with less grade than those on badly eroded fields having an impervious subsoil, and open-end, level terraces may be used on gentle, well-drained slopes where the soil has an exceptionally high infiltration rate. Much care, however, should be exercised in their construction and maintenance. Closed-end, level terraces should not be used, owing to the high intensities of the rainfall of the region.

The authors point out that owing to the widely diversified agriculture of the region, its small farms, and the character of the rainfall, any land use or conservation program adopted will have to possess sufficient flexibility to meet the particular requirements of the individual farm operator if it is to obtain any degree of success. There is little hope of changing the basic system of agriculture in the region as long as the present economic system prevails, nor is such a change desirable. Localized modifications of the agricultural sys-

tem have been observed in different parts of the area during the period of experimentation, but have not been of sufficient extent to warrant a change of recommended land use practices. The production of fruit and vegetable crops together with dairy and poultry products enables the average farmer to attain a high degree of self-sufficiency. This is an asset of almost inestimable value to an erosion-control or land use program. The growing of fruit and vegetable crops, however, requires intensive cultivation. This subjects the land on which these crops are grown to serious erosion unless appropriate conservation measures are applied. And finally, a wise land use program for the problem area calls for retiring the steeper slopes from cultivation, terracing the more gently sloping cultivated areas, and adopting appropriate and effective agronomic practices for the terraced fields in order to maintain their productivity and to further protect the soil from erosion.

Effect of soil treatment on soil productivity: A summary of long-time field experiments, F. C. BAUER, A. L. LONG, C. J. BADGER, L. B. MILLER, C. H. FARNHAM, P. E. JOHNSON, L. F. MARRIOTT, and M. H. NELSON (*Illinois Sta. Bul. 516 (1945), pp. 106-224+, about 10 illus.*).—This bulletin presents a comprehensive account of the effect of soil treatment on soil productivity as determined by numerous long-time field experiments conducted in various sections of the State. Data are presented in 85 tables on the effect of soil treatments on different crop yields under various soil types. Nine systems of soil treatments were established on each of the Illinois experiment fields when they were laid out, four designed for livestock farming and five for grain farming. These systems, involving a step-by-step build-up from no treatment to somewhat complex combinations, have been maintained with but little change to date. Detailed information is given on soil conditions on the several test fields. On a poor soil a complete treatment consisting of the use of crop residues, limestone, rock phosphate, and potash produced an average yearly income per acre for the 35-year period 1910-44 of \$18.89, while under a system involving no soil treatment the yearly return was only \$3.97. On one of the most productive soils good land treatments have been responsible for a much smaller share of crop yields than on the poor land. For the good soil, average yearly income for the period indicated above for the complete soil treatment was \$26.10 while with no soil treatment the return was \$23.32.

The effect of mineral supply on the mineral concentration and nutritional quality of plants, K. C. BEESON. (U. S. D. A.). (*Bot. Rev. 12 (1946), No. 7, pp. 424-455, illus. 1*).—This extensive review (124 references) considers the effects of various fertilizer elements on the P and Ca contents of plants, the effects of micronutrients on the mineral composition of plants, investigations with nutrient solutions, and the effects of fertilization on the quality of forages as measured in terms of animal growth and health. A number of generalized conclusions developed from the published data are presented and discussed.

Fertilizers and lime in the United States: Resources, production, marketing, and use, F. W. PARKER, J. R. ADAMS, K. G. CLARK, K. D. JACOB, and A. L. MEHRING (*U. S. Dept. Agr., Misc. Pub. 586 (1946), pp. 94+, illus. 23*).—The resources, production, marketing, and use of fertilizers and lime are reviewed and discussed. The information is presented to serve as basic material in the formulation of a national policy with respect to fertilizer use. A list of over 100 selected references is appended.

Preparation of ammonium nitrate for use as a fertilizer, W. H. ROSS, J. R. ADAMS, J. Y. YEE, C. W. WHITTAKER, and K. S. LOVE (*U. S. Dept. Agr., Tech.*

Bul. 912 (1946), pp. 80, illus. 13).—Although considerable attention has been directed recently to ammonium nitrate as a fertilizer, it cannot be considered a new fertilizer material except when used directly as such. As a fertilizer material it has been sold in the form of products known as Nitrogen Solution, Leunasalpeter, and Cal-Nitro. It has been produced commercially by the methods of crystallizing, graining, and spraying. Each particle of monocrystalline ammonium nitrate as obtained in the most recent methods of preparation consists of a single crystal, whereas the particles of sprayed or grained material consist of aggregates of crystals. The grained ammonium nitrate is about twice as porous as the monocrystalline material and the sprayed material about five times as porous. These differences in porosity have a marked effect on the capacity of the different types of ammonium nitrate to hold absorbed moisture and on their tendency to cake under varying climatic conditions. A slight change in moisture content has a greater effect on the caking of ammonium nitrate than a corresponding small change in any of the other factors that affect its tendency to cake. The most effective conditioning agents for reducing caking are Celite, Dicalite, Kittitas and other forms of kieselguhr, kaolin and other types of clay, plaster of paris, and tricalcium phosphate. The most effective water repellents for decreasing the rate of moisture absorption from the air are mixtures of paraffin with petrolatum or asphaltum and of petrolatum and paraffin with asphaltum or rosin.

Tests under carefully controlled conditions with standard farm equipment indicate (1) that the drillability of any given material increases with the uniformity of its particle size; (2) that the sprayed ammonium nitrate now on the market is more drillable than the grained material, owing to differences in particle size; and (3) that granular ammonium nitrate that has been treated with a water repellent and a conditioning agent is more drillable under conditions of high humidity than when treated with a conditioning agent alone. Although a double treatment with a water repellent and a conditioning agent greatly improves the drillability of ammonium nitrate under conditions of high humidity, the use of a water repellent is not considered necessary in sections where the prevailing humidity is relatively low. Bags now on the market are capable of maintaining properly conditioned ammonium nitrate in a satisfactory mechanical condition for at least a year in the most humid sections of the country.

Placement of nitrogen fertilizer for corn and oats, J. PITNER (*Miss. Farm Res. [Mississippi Sta.], 9 (1946), No. 2, pp. 1,7*).—Experiments on rates, methods of application, and sources of nitrogen for cotton and corn showed that plow sole application produced a significantly higher yield of cotton and corn than the furrow, side-dress, or deep method of application.

AGRICULTURAL BOTANY

Elementary bacteriology, J. E. and E. O. GREAVES (*Philadelphia and London: W. B. Saunders Co., 1946, 5. ed., [rev.], pp. 613 +, illus. 169*).—In this edition of the textbook previously noted (*E. S. R., 84, p. 23*) a chapter on antibiotics has been added; many chapters have been completely rewritten and nearly all have been greatly modified.

[The effects of various chemicals on bacteria and fungi—particularly yeasts] (*Compt. Rend. Lab. Carlsberg, Sér. Physiol., 24 (1946), No. 12-17, pp. 133-184, illus. 1*).—The following papers are included: The Influence of α , γ -Dihydroxy- β , β -Dimethyl-Butyric Acid on Yeast Growth, by V. Hartelius and G. Johansen (pp. 133-140); Antivitamin Effect on Sulfanilamide on

Saccharomyces cerevisiae (pp. 141-155), Antivitamin Effect of Sulfanilamide on *Streptobacterium plantarum* (pp. 156-162), and Effect of Marfanil on *Streptobacterium plantarum*, *Saccharomyces cerevisiae*, and *Aspergillus niger* (pp. 163-171), all by V. Hartelius and K. Roholt; Effect of Benzoic Acid and Benzoic Acid Derivatives on the Growth of *Streptobacterium plantarum* and *Saccharomyces cerevisiae*, by K. Roholt (pp. 172-177); and Antivitamin Effect of Sulfanilamide on *Aspergillus niger*, by V. Hartelius (pp. 178-184).

[Papers in bacteriology] (*Jour. Bact.*, 51 (1946), No. 5, pp. 576-577, 595, 599-600, 635-636).—The following miscellaneous abstracts are included: Mechanism of Pyridoxal Phosphate Function in Bacterial Transamination, by W. W. Umbreit, D. J. O'Kane, and I. C. Gunsalus (Cornell Univ.); The Production of Fungal Amylases in Submerged Culture and Their Use in the Production of Industrial Alcohol, by J. M. Van Lanen and E. H. LeMense (U. S. D. A.); Commercial Inoculation of Legume Seed, by F. S. Orcutt and A. L. Whitman (Va. A. and M. Col.); and The Relationships of the Gram-Negative, Nonsporeforming, Peritrichous Bacteria to Nonmotile Bacteria, by R. S. Breed (N. Y. State Expt. Sta.).

Glass bacteriological filters arranged for positive pressure, M. T. BUSH (*Jour. Bact.*, 51 (1946), No. 4, pp. 531-532, illus. 1).—In spite of the advantages of positive pressure filtration in both chemical and bacteriological work, negative pressure seems to be used almost universally in the laboratory. Various setups tried by the author were not entirely satisfactory because the compressed air leaked out. It was not until Corning UF filters became available recently that it was feasible to construct an apparatus with ground joints. The set-up described and illustrated has proved satisfactory; in the author's experience it does not let bacteria through during prolonged filtrations if the solutions being filtered do not provide good growing conditions. When such a solution does provide a good bacterial medium, the pressure filter may be set up in the ice box. If the filter is washed with distilled water immediately after use, ordinary air-borne contaminants apparently cannot "grow through" the filter.

The bacteriophage as a means of identifying bacteria, R. C. THOMAS (*Ohio Sta. Bul.* 659 (1945), pp. 175-176).—In this study the phage reaction was found to be useful for species identification in bacteria pathogenic to both plants and man; 10 species in all were used.

Ultrasonic disintegration as a method of extracting bacterial enzymes, P. K. STUMPF, D. E. GREEN, and F. W. SMITH, JR. (*Jour. Bact.*, 51 (1946), No. 4, pp. 487-493, illus. 2).—The authors describe a technic for disintegrating bacterial cells by ultrasonic radiation, employing the method to prepare cell-free extracts of bacterial enzymes. A number of factors influencing the degree of efficiency of ultrasonic disintegration are discussed.

Influence of incubation temperatures on differential tests of coliform bacteria, J. E. FULLER. (Mass. Expt. Sta.). (*Jour. Bact.*, 51 (1946), No. 4, pp. 457-464).—Coliform cultures isolated from rural water supplies were studied to determine the effects of incubation at 37°, 40°, 44°, and 46° C. on their reactions to differential tests. Only *Escherichia coli* produced gas effectively in lactose broth at 46°; this test was selective only for indole-positive *E. coli*, as contrasted with the other strains studied. Endo's medium plates were streaked from lactose broth cultures incubated at the several temperatures; these—incubated at 37°—showed typical results for *E. coli* throughout the temperature range employed, but results for other strains were variable and lacked definition. The methyl red test at 44° indicated a definite relationship of all *E. coli* and *Citrobacter* strains, including those that were indole-negative; the number of positive tests declined substantially at 46°. The Voges-

Proskauer and sodium citrate tests gave no significant information above 37°. The findings suggest that the methyl red test at 44° may prove useful as a confirmatory test for evaluating the sanitary significance of atypical or intermediate strains of coliform bacteria isolated from raw water.

A procedure for the characterization of acetic acid bacteria, J. TOSIC and T. K. WALKER (*Brewers Digest*, 21 (1946), No. 7, pp. 31-34, 39, *illus.* 5).—The acetic acid bacteria are important beer spoilage organisms which, if left unrecognized and uncontrolled, may cause serious losses by rendering the beer sour and ropy. A number of species isolated from brewers' yeast and beer have been described in the literature (7 references). In this paper consideration is given to the precautions necessary in standardizing the conditions for examining cultures of *Acetobacter* spp. in order that comparisons may be obtained for diagnostic purposes. The media and technic employed are described in detail, and particulars are given of 10 species examined under the standardized conditions adopted.

Capsule formation by *Acetobacter* species, D. KULKA and T. K. WALKER (*Jour. Inst. Brewing*, 52 (1946), No. 3, pp. 129-131, *illus.* 3).—The authors found that although most of the methods available for staining bacterial capsules gave negative results when applied to the "acetic acid bacteria," Baker's procedure served admirably to demonstrate the presence of encapsulated cells in cultures of these organisms. Gin's technic was also found entirely suitable; when applied to cells of 14 species of *Acetobacter*, it revealed the presence of capsules in every case. It is believed probable, therefore, that capsule formation is a characteristic of species of this genus.

***Acetobacter* infection.**—III, A study of strains of *Acetobacter acetosum*, isolated, respectively, from "pitching" yeast and from beer, D. KULKA, J. TOSIC, and T. K. WALKER (*Jour. Inst. Brewing*, 52 (1946), No. 3, pp. 132-135, *illus.* 2).—In studies of *Acetobacter* spp. liable to occur as contaminants in brewery products, an examination was made of two strains of acetic acid bacteria—one isolated from the pitching yeast of a brewery and the other from a sample of sour beer from another brewery; both were found to be strains of *A. acetosum*, a vinegar organism that undoubtedly can establish itself under favorable circumstances as a nuisance in beer breweries. To distinguish these two strains, they are here designated as Y and B strains of the species; these strains are compared with an authentic culture of the type organism, *A. acetosum*.

Aerobic mesophilic sporeforming bacteria, N. R. SMITH, R. E. GORDON, and F. E. CLARK (*U. S. Dept. Agr., Misc. Pub.* 559 (1946), pp. 112, *illus.* 3).—The authors studied 621 cultures of aerobic mesophilic sporeformers, of which 363 bore specific names and 258 were unnamed. These cultures were placed in 3 groups on the basis of their morphology and physiology. For separating certain species, a modified Voges-Proskauer test proved reliable. Fat storage and the fermentation of C compounds in the presence of inorganic N were studied extensively. Of special significance was the ability of certain strains to produce adaptive enzymes so that carbohydrates not regularly attacked could be utilized; in many cases this ability was lost after a few months' storage in the absence of the particular carbohydrate. Agglutination by antisera produced with whole cells as antigens and lysis by some bacteriophages were too specific for taxonomic use. Other phages—especially for *Bacillus megatherium*, *B. cereus* and its varieties, *B. pumilus*, and *B. brevis*—proved very useful. By inducing variations in certain strains of a species and/or observing similar variations as they existed among strains in the collection, a "species pattern" was developed in each case. It was found that

many species previously described and separated from others were merely growth stages of established species, and that others were biotypes or morphotypes of the "parent species"; consequently, a large number of named cultures have been placed in the synonymy of the accepted species, which has resulted in a reduction from about 120 to 15 specific names. A dichotomous key is given in which two characters instead of one are—insofar as possible—used at each separation. A variation or misinterpretation of one of these should not, therefore, lead to a wrong conclusion. There are 119 references.

Subtilin—an antibiotic produced by *Bacillus subtilis*, I, II, A. J. SALLE and G. J. JANN. (Univ. Calif.). (*Soc. Expt. Biol. and Med. Proc.*, 60 (1945), No. 1, pp. 60–64, illus. 2; 61 (1946), No. 1, pp. 23–24, illus. 1).—Two papers are presented:

I. *Action on various organisms*.—This antibiotic was found active against gram-positive bacteria and against *Neisseria* of the gram-negative group; acidfast organisms, including *Mycobacterium tuberculosis*, were likewise susceptible to it. It produced a bacteriostatic action in high dilution and a germicidal effect in greater concentration. A number of pathological higher fungi were also found susceptible to subtilin.

II. *Toxicity of subtilin to living embryonic tissue*.—In this contribution, two notable exceptions to the usual action of this antibiotic are stressed, viz, *N. catarrhalis* and *N. gonorrhoeae*—both gram-negative—which are antagonized by subtilin. The antibiotic exhibited an extremely low toxicity for embryonic chick heart tissue fragments cultured in vitro. Under the test conditions subtilin was about 20 times more toxic to *Staphylococcus aureus* than to chick heart tissue.

Rapport entre la production d'anhydride carbonique et l'activité bactériostatique du *Penicillium notatum* culture superficielle [Relation between the production of CO₂ and the bacteriostatic action of *P. notatum* in surface culture], M.-M. JANOT, H. PENAU, H. VELU, G. BOUET, M. CHAIGNEAU, and M. CHOIX (*Compt. Rend. Acad. Sci. [Paris]*, 222 (1946), No. 18, pp. 1054–1056).—It is concluded that the rate of evolution of CO₂ into the air surrounding the culture is no indication of the bacteriostatic activity of the *P. notatum* crop.

Penicillin production by a superior strain of mold, M. J. JOHNSON, J. J. STEFANIAK, F. B. GAILEY, and B. H. OLSON. (Univ. Wis.). (*Science*, 103 (1946), No. 2678, pp. 504–505).—The figures in this note represent a small part of the data obtained during an investigation of the factors influencing fermentation time and yield of penicillin in submerged cultures. The results obtained when a number of penicillin-producing mold cultures were tested in 80-gal. tanks are summarized. The superior strain of mold is referred to as No. X-1612.

Production of penicillin X in "submerged" surface cultures, E. STICE and R. PRATT (*Science*, 103 (1946), No. 2678, pp. 535–537, illus. 2).—The unit described and illustrated was originally devised to incorporate in surface cultures the advantages of the deep-vat method of fermentation; cultures grown in it have consistently yielded relatively large proportions of this antibiotic. The apparatus is simple in design and easily constructed and is said to produce a continuous supply of penicillin for several weeks without resterilization or reinoculation.

Microbiological aspects of penicillin.—IV, **Production of penicillin in submerged cultures of *Penicillium notatum***, J. W. FOSTER, H. B. WOODRUFF, and L. E. MCDANIEL (*Jour. Bact.*, 51 (1946), No. 4, pp. 465–473, illus. 1).—In this paper of the series (E. S. R., 93, p. 128).—temporarily held up from pub-

lication by "a U. S. Government secrecy order"—it is shown that growth of suitable *P. notatum* strains in shake culture (submerged growth developed by agitation and aeration) leads to the rapid formation of potent penicillin broths. This procedure is said to have numerous advantages over surface cultures; among them, the variable factors of diffusion and pellicle formation are eliminated, and growth and metabolic processes are accelerated. A determining factor in submerged culture work is the selection of a suitable strain of mold. Penicillin formation occurs in shake cultures in a nearly synthetic medium in which brown sugar supplies certain substances essential for growth and penicillin formation. Crude organic supplements hasten the development of *P. notatum* and increase the maximum penicillin titer yielded. Corn steep liquor serves as an excellent supplement, provided its reserve acidity is adjusted with NaOH, CaCO_3 , or both. Sugar concentration has but slight effect on penicillin formation; maximum production was obtained after the disappearance of sugar from the medium. Other organic supplements—particularly cottonseed meal—promoted penicillin formation in the same way as corn steep. Evidence is presented that there are two factors promoting penicillin production—one organic and the other inorganic; brown sugar contains both, and cottonseed meal contains at least the organic factor. Of paramount importance in the production of penicillin in submerged cultures is the maintenance of an adequate O_2 supply.

Gladiolic acid: An antifungal and antibacterial metabolic product of *Penicillium gladioli* McCull and Thom, P. W. BRIAN, P. J. CURTIS, J. F. GROVE, H. G. HEMMING, and J. C. MCGOWAN (*Nature [London]*, 157 (1946), No. 3995, pp. 697–698).—A preliminary account.

Brazilian chytrids.—VIII, Additional parasites of rotifers and nematodes, J. S. KARLING (*Lloydia*, 9 (1946), No. 1, pp. 1–12, illus. 53).—The new species *Olpidium granulatum* and *O. rotiferum* are described and illustrated as parasitizing rotifer eggs and adults.

Brazilian chytrids.—IX, Species of *Rhizophydium*, J. S. KARLING (*Amer. Jour. Bot.*, 33 (1946), No. 5, pp. 328–334, illus. 37).—In continuation of this series (see above) 12 species of this fungus were isolated from water and moist soil samples; of these 7 are new—3 of them hyperparasites of Oomycetes, Zygomycetes, and other chytrids, 3 parasitizing microscopic animals, and the others attacking algae, fern spores, and pollen grains.

Pure cultures of algae, their preparation and maintenance, E. G. PRINGSHEIM (*Cambridge, Eng.: Univ. Press*, 1946, pp. 119+, illus. 9).

Plant-hunting in China: A history of botanical exploration in China and the Tibetan marches, E. H. M. COX (*London: Collins Clear-Type Press*, 1945, pp. 230, illus. 28).

The estimation of ground conditions from aerial photographic interpretation of vegetation types, R. N. COLWELL (*Photogrammetric Engin.*, 12 (1946), No. 2, pp. 151–161, illus. 9).—The engineer, forester, or geologist contemplating ground reconnaissance of an area unfamiliar to him can profit greatly by detailed advance information based on aerial photographs. For example, it appeared that within a certain area a shallow and fertile layer of topsoil was underlain by a very porous substrate which reduced surface run-off to a minimum. Various examples of vegetation identification are also presented, and the use of this technic for military purposes is discussed.

Plant immigrants and stowaways—their romantic story, A. McTAGGART (*Melbourne: Lothian Pub. Co.*, 1945, pp. 62+).—"It has been the aim of the writer of this small volume to gather together and recount as many as possible of the interesting stories associated with plant introduction or migration, particularly those exhibiting elements of romance or unusual features."

The evaluation of taxonomic characters of cultivated Brassica with a key to species and varieties.—I, The characters, V. G. SUN (*Bul. Torrey Bot. Club*, 73 (1946), No. 3, pp. 244–281, illus. 13).—Though much has been published on this genus of the mustard family, workers have been influenced by the demand of economic botanists for a satisfactory agricultural classification; the author believes that the resulting combination of botanical principles and agricultural convenience is responsible for much confusion and that a better classification has long been needed. The evaluation of morphological characters in conjunction with studies of the genetics and cytology of interspecific hybrids has been used in developing a system based primarily on botanical principles. In devising the system presented, he has attempted to use only such characters as are indicative of fundamental differences in genetic constitution; in carrying out this design the following important characters are discussed: Size of pollen grains, hairiness of plant, stem and root characters, shape of foliar organs, glaucescence and color of plant, branching habit, type of inflorescence and of sepals at anthesis, size, shape, and color of petals, length and shape of the silique and its beak, angle between pedicels and rachis, number of seeds per silique, and color and size of seeds.

Notes on the flora of Taylor County, Texas, W. L. TOLSTEAD and V. L. CORY. (Univ. Nebr. et al.). (*Field and Lab.*, 14 (1946), Nos. 1, pp. 32–48, illus. 3; 2, pp. 49–69, illus. 2).

Notes on the types of some Californian species of Convolvulus, L. ABRAMS (*Stanford Univ., Dudley Herbarium Contrib.*, 3 (1946), pt. 11, pp. 351–373, illus. 4).

Studies in the Sapotaceae.—V, The South American species of *Chrysophyllum*, A. CRONQUIST (*Bul. Torrey Bot. Club*, 73 (1946), No. 3, pp. 286–311).—In this further contribution (*E. S. R.*, 94, p. 602), 30 species of *Chrysophyllum* are described, involving considerable new taxonomy; a key to these species is provided.

Effect of radioactive elements upon development of the root-nodule bacteria and upon the assimilation by them of the molecular nitrogen of the atmosphere. A. A. DROBKOV (*Compt. Rend. (Dok.) Acad. Sci. U. R. S. S., n. ser.*, 49 (1945), No. 3, pp. 224–226).—Root-nodule bacteria are, in general, extremely sensitive to deficiencies in individual minor elements; radioactive elements are said to occupy an outstanding place in this respect. When radium or other radioactive elements were carefully eliminated from the nutrient medium no nodules were formed on the roots of peas, even when the medium contained B and Mn and was inoculated with the nodule bacteria. When radium was introduced at 10^{-10} per 1,000 cc. of nutrient solution, the nodule bacteria developed intensely on the roots of young peas and assimilated nearly twice as much molecular N from the air as the controls, even when normal doses of N were contained in the nutrient medium.

Variation within strains of clover nodule bacteria in the size of nodule produced and in the "effectivity" of the symbiosis, P. S. NUTMAN (*Jour. Bact.*, 51 (1946), No. 4, pp. 411–432, illus. 5).—The author describes studies of the symbiotic behavior of two strains of *Rhizobium* as influenced by host passage and by storage in soil or on agar media. The results refer to mean length and "effectivity" of nodules on red clover grown under bacteriologically controlled conditions. The original culture of the effective strain (A) proved to be uniform for behavior of isolations from replicate colonies, though considerable variation occurred among the responses of individual plants infected from the same colony. Neither plant passage with or without intervening plating or short-time culture on agar nor selection from large or small

nodules had any effect on the mean size or effectivity of the nodules formed by this strain. Similarly, plant passage failed to modify the behavior of the ineffective strain (H. K. C.). On the other hand, after storage of A in sterilized Woburn sandy soil, ineffective variants were found to constitute a considerable proportion of the bacterial population; these variants resembled the parent type in cultural and serological characters. After passage of these ineffective variants through the plant, two reversions to the effective parent type occurred among the 13,400 nodules examined; these remained effective on further host passage. Stock cultures on agar slants—both of the effective type and of the ineffective variant—exhibited an occasional tendency to produce new variants in effectivity. Variants in type of growth on agar also appeared under these conditions. There are 19 references.

Bacterial root nodules in the Zygophyllaceae, Y. S. SABET (*Nature [London]*, 157 (1946), No. 3994, pp. 656-657, illus. 2).—A note on the root nodule bacteroids of *Fagonia arabica*, *Tribulus alatus*, and *Zygophyllum* spp. Not experiments with *Z. coccineum* appeared to show that these plants cannot thrive unless nodules are developed and that the bacteroids provide the hosts with N.

Plant physiology in the U. S. S. R., E. ASHBY (*Nature [London]*, 157 (1946), Nos. 3991, pp. 558-561; 3992, pp. 596-597).—This "very brief account is incomplete and should not be regarded as critical, but it will give some idea of the variety of work going on and the whereabouts of the principal workers."

Phycomyces in the assay of thiamine in agar, D. DAY and A. H. HERVEY. (Univ. Minn. et al.). (*Plant Physiol.*, 21 (1946), No. 2, pp. 233-236).—*P. blakesleeanus* was grown on a basal medium of distilled water, minerals, dextrose, and asparagine plus purified agar and thiamine in various proportions and combinations; the mycelium was harvested by the hot and cold water methods, which included use of aluminum pans and Gooch crucibles. With the basal liquid medium, the dry weight of mycelium washed with cold water was higher than that washed with hot water, probably because of the action of the latter in dissolving substances from the fungus. The higher dry weight of mycelium grown on agar and washed with cold water might be explained not only by this action of the hot water but also by the incomplete separation of the agar and the mycelium by the cold water. Reduced growth was generally correlated with an increased amount of agar.

Parthenocarpy and accompanying hormonal syndromes induced by unrelated chemicals, L. J. HAVAS (*Nature [London]*, 157 (1946), No. 3993, pp. 629-630).—A note on the author's induction of parthenocarpy in cucumber by ethyl mercury phosphate and acenaphthene and in tomato by colchicine. In addition to giving evidence of induction of parthenocarpy by a mercury compound chemically unrelated to substances previously shown to exhibit that property, he stresses the hormonal effects. Taken together, he believes that the findings confirm the suggestion that there is essentially a common mechanism at work, viz, a disturbance of the vertical polarity of translocation of endogenous hormones and of the hypercompensations resulting therefrom.

Growth inhibiting action of urine extract on seedlings, E. D. BRAIN (*Ann. Bot. [London]*, n. ser., 10 (1946), No. 38, pp. 195-202).—Experiments were performed on cut epicotyls of garden pea and broadbean to test the action of urine extract (H 11), β -indoleacetic acid, sodium indoleacetate, and certain anthraquinone derivatives on the growth of lateral buds. H 11 caused marked inhibition of the growth of side shoots and swelling in the cut stems. Treatment with β -indoleacetic acid inhibited the growth of side shoots and swelling

in the cut stems, but a concentration of 6,250 units per gram caused less swelling than H 11 extract. Comparison of the effects of β -indoleacetic acid and sodium indoleacetate showed more swelling in the cut stems after treatment with the sodium salt. Solutions of anthraquinone and the refined sodium salt of anthraquinone disulfonic acid caused inhibition of side shoots and slight increase in the height of cut stems; 1 : 5 dihydroxyanthraquinone gave less growth in the cut stems and increased growth of side shoots as compared with control plants. The findings indicate that the swelling of the stem following application of concentrated solutions of β -indoleacetic acid is independent of the inhibition effect on lateral buds, and also that other substances, such as members of the quinone series, can inhibit the growth of side shoots.

Études sur les enzymes de la fève gourgane (*Vicia faba* L.) pendant la germination, J. LABARRE and S. PFEFFER (*Rev. Canad. Biol.*, 5 (1946), No. 2, pp. 233-246, illus. 4; *Eng. abs.*, p. 245).—The germinating broadbean was found to contain two amylases, viz, α -amylase, which attained maximum activity about the eighth day, and β -amylase, which reached its highest activity about the tenth day of germination. The optimum pH for the amylase calculated as β -amylase was 5.3; the optimum temperature, 45° C. The proteases were at their maximum about the eighth day of germination; three were noted at pH optima of 2.05, 4.18, and 7.85; the optimum temperature was 45°. Ascorbic acid determinations indicated the presence of an ascorbic acid oxidase which was at a maximum at the seventh to ninth days of germination. Attempts to find urease were unsuccessful. The rH of the broadbean became more positive during the later stages of germination. There are 24 references.

Étude microcalorimétrique du développement des cultures bactériennes et de la germination des graines [Microcalorimetric study of the development of bacterial cultures and of the germination of seeds], H. PRAT, E. CALVET, and J. FRICKER (*Rev. Canad. Biol.*, 5 (1946), No. 2, pp. 247-250, illus. 1; *Eng. abs.*, p. 250).—Using Tian's microcalorimeter, the authors studied the heat production during the course of seed germination and the development of bacterial cultures. In seeds of a variety of plants two distinct phases were observed, viz, one of physicochemical and one of biological thermogenesis; the two phases are compared for the different species and some factors influencing each phase are discussed. In bacteria, each strain was found to have a specific thermogenesis curve; the experimental conditions modifying this curve were studied.

Growth correlates of electromotive forces in maize seeds, O. E. NELSON, JR., and H. S. BURR. (Conn. [New Haven] Expt. Sta. et al.). (*Natl. Acad. Sci. Proc.*, 32 (1946), No. 4, pp. 73-84, illus. 5).—For any maize there are said to be two possible potential determinations: (1) The prime potential appears to be highly correlated with seed viability, but with no measured attribute of plant growth; (2) the equilibrium potential is not correlated with seed viability but rather with the inherent genetic constitution of a plant, since by use of the potentiometer and equilibrium potential determinations it becomes possible to segregate from a given population those seeds with superior growth characteristics. Furthermore, these potential differences among seeds were highly correlated with the growth of progeny one generation removed. For these reasons, it is believed that the potentiometer may prove a useful tool for plant breeders.

Preliminary experiment on the cultivation of *Baeria chrysostoma* under sterile conditions, S.-W. LOO (*Amer. Jour. Bot.*, 33, (1946), No. 5, pp. 382-

389, illus. 4).—By growing plants under sterile conditions certain problems may be studied in a simplified and controlled way. The author shows that *B. chrysostoma* (branchy goldfields) plants can grow to maturity and produce seeds under aseptic conditions; he has found no record in the literature of any higher plant being successfully cultured for a complete life cycle under sterile conditions. Low night temperatures produced the best growth in *Baeria*, irrespective of the daytime temperature; best growth was obtained at 26° C. in the daytime combined with 13° at night. Production of leaves was unaffected by different day or night temperatures, but their width increased with rises in the night temperature. Growth was improved by adding two percent sugar to the nutrient medium; "osmotic adaptation" apparently took place. Nitrate proved the best source of N, but urea was utilized to a considerable extent. Long photoperiod and added sugar accelerated the initiation and production of flowers; these factors had a significant effect on the development of young plants, but flowers were produced under short-day conditions provided the plants were kept in culture long enough.

Development in sterile culture of stem tips and subjacent regions of *Tropaeolum majus* L. and of *Lupinus albus* L., E. BALL (*Amer. Jour. Bot.*, 33 (1946), No. 5, pp. 301–318, illus. 16).—Very small stem tips (A-pieces) and cubes of subjacent maturing tissues (B- and C-pieces) of *Tropaeolum* and *Lupinus* were grown and studied in sterile cultures. The A-pieces utilized the water, sucrose, and mineral salts of the nutrient solution and demonstrated their pronounced capacity for development by growing into entire plants. The stem tip of *Tropaeolum*, having a lower respiratory rate than its subjacent tissues, would grow into a complete plant only beneath the agar; that of *Lupinus*, having the highest respiratory rate of the shoot, would grow into a complete plant only on the agar surface. This behavior indicates that primary meristems cannot all be characterized by low O₂ consumption. The polarity of the stem tips was not altered by inverted or horizontal orientations to gravity; furthermore, the curvatures in various orientations suggested that the shoot apex controls the curvature of the subjacent tissues. Plants grown from the shoot tips contained normal, though small, vascular systems, which had been "determined" by the activities of their shoot apices entirely separated from the influences of the original plant body. According to the author's interpretation, the shoot apex is not merely a plastic region that obeys the impulses sent to it from the mature subjacent regions, but actually controls or "determines" the growth and behavior of the subjacent regions.

The B- and C-pieces grew best in an aqueous medium to which unautoclaved coconut milk had been added. Those of *Lupinus* produced spherical masses that usually grew by cambiumlike zones considerably beneath the original cut surfaces. Internally, this cambium produced parenchyma and very short tracheal elements; externally, it produced parenchyma and some cells that appeared to be sieve-tube elements. By contrast, the subjacent tissues of *Tropaeolum* had various regions of superficial cells that underwent rapid mitoses, the end result being an irregular mass of parenchymatous cells that only infrequently contained groups of tracheal elements. The calluses from neither plant regenerated roots or buds. The original polarity of these subjacent regions was not retained in culture; the calluses were radially differentiated and therefore without polarity. The growth of the B-pieces was always greater than that of the C-pieces, corresponding with earlier findings that the respiratory rate of the B-piece was greater than that of the C-piece.

The results of these studies are interpreted as suggesting that there is a decreasing capacity for growth and development in these small volumes of tissues down the plant axis; this phenomenon is labeled physiological differentiation. It is considered to agree with the suggestions in the literature that not all living plant cells are possessed of "unlimited capacity for development," but that this capacity is restricted to a very few tissues. The shoot is considered to possess in the highest degree the capacities for developing the entire plant; its subjacent tissues, to possess these capacities to only a limited extent. This interpretation is contrasted to other suggestions in the literature (60 references) that theoretically every living plant cell is capable of producing any cell organization characteristic of the species.

Streaming movements of solutions in plants, D. T. MACDOUGAL (*Amer. Jour. Bot.*, 33 (1946), No. 5, pp. 318-328, illus. 5).—According to the author, filaments or liquid in the hydrostatic system of plants may be visualized as a cohesive meshwork occupying conduits in the xylem, rays, and phloem and extending through the moist walls and membranes to the vacuoles of all or nearly all living cells of the plant. Tensions set up in the system by vaporization from cell walls in the leaves cause a flow of many centimeters per hour in nonliving conduits; increasing tensions result in reduced diameter of nonliving elements with collapsible walls and of volume of turgid cells. These variations were greatest in the phloem of the trees examined. Abrupt contractions from accelerated transpiration at sunrise continued for 5 to 7 hr. and were relieved the following 17 to 18 hr. beginning after midday by osmotic action with lessened tensions. The course of movement in the conduits is in the form of a whirlpool, in which the ascending sap constitutes the main stream with the downwardly flowing leaf products being drawn in radially or laterally at all levels to be carried upward. Inequalities of conversion may be followed by upward movements in the phloem. The supposedly phosphorylated carbohydrates formed in the leaves are translocated as such in *Pinus radiata*. Condensation into starch occurs only in the rays. The concentration estimated as glucose is highest in the outermost layer of wood and least in the conduits in which the most rapid movement of sap takes place. Seasonal variations consonant with photosynthetic activity and growth are recognizable. Girdling of *Pinus* cuts a sector of the phloem out of the circulatory system, and the leaf products in the region below the girdle are depleted by being drawn into the xylem. Inactivation of the cambium follows. Growth may be resumed if the supply of leaf products is renewed by translocation across the girdle through callus bridges. Traumatic reactions to girdling include the formation of callus at the upper margin of the denuded zone, inhibition of growth for several days, and a subsequent heavy accumulation of starch in the hypertrophied wood parenchyma in a segment of the trunk known to extend 4 m. above the denuded zone in the Monterey pine. No analysis was made of the auxins and accessory substances which would necessarily accumulate above the girdle. The effects of defoliation of pines are attributable to stoppage of photosynthesis and reductions in movement in the hydrostatic system by relaxed tensions.

The immediate effects of girdling of *Sequoia* are parallel to those of *Pinus* in the earlier stages, but later 20 to 25 layers of exposed sapwood of *Sequoia* desiccate rapidly and are in a dry and crumbling condition by the end of the season. Subsequently the upward movement of sap is in heartwood through the girdled zone. The scheme of translocation is delineated by which leaf products of an accessory trunk are conducted basipetally in a large root and upward in the xylem and phloem to the lower margin of a girdle. Growth

in trunk and crown took place at a gradually diminishing rate during 21 seasons after girdling a *Sequoia*. Half of the wood below the girdle was burned away at the end of this period, but some green leaves were maintained for a further period of 4 yr., which may be taken as a maximum of endurance. A large *Sequoia* in which fire had destroyed a cone of heartwood in the basal region gave opportunity for observation of the effects of a fortuitous operation complementary to girdling. The outer wood and phloem were in the form of segments of a thin shell. Continuing growth at a reduced rate after 48 yr. was noted. There are 19 references.

Om kemiske Plankeanalyser og deres Anvendelse (On chemical analyses of plants and their use), F. STEENBJERG (*Tidsskr. Planteavl.*, 49 (1944), No. 1, pp. 158-174, illus. 3; *Eng. abs.*, pp. 173-174).—On the basis of pot and field experiments it is shown that the relationship between the percentage of a nutrient in the dry matter of a plant and the amount of it supplied to the soil is expressed by a curve which first falls and then rises as the content of the nutrient in question is increased in the soil. When the experimental results are shown in a system of coordinates in which the ordinates express the amount of dry matter formed and the abscissas give the amount of nutrient absorbed, the result is an S-shaped curve, the point of inflection of which corresponds with the minimum of the curve. Such a curve was observed, however, only when the soil in which the plants grew passed from very deficient to less deficient to rich in the nutrient in question. All the plants were analyzed at maturity except grass, which was analyzed as green hay; the analyses concerned N, P, K, Mn, and Cu. These observations appear to explain several peculiar results encountered in field work, where attempts have been made via plant analyses to show that one soil is richer in a certain plant nutrient than another; thus, by sampling crops in the field, it is often found that the sample representing a crop which would be expected to be most deficient, e. g., in Cu, actually has the highest percentage of this element in its dry matter. It therefore appears necessary to use chemical plant analyses with caution as diagnostic criteria of the deficiency of soils and crops in plant nutrients; this technic should never be used alone, but always in connection with other methods of determination. It is pointed out that experimental evidence tends to show that there are other problems and possibilities which may complicate the problem.

Effect of alkali upon germinating capacity of seeds of kok-saghyz and of common dandelion, O. A. PETROVA (*Compt. Rend. (Dok.) Acad. Sci. U. R. S. S.*, n. ser., 49 (1945), No. 3, pp. 227-228).—When seeds of *Taraxacum* spp. were treated with 5 percent solutions of KOH or NaOH the plants developing from treated *T. koksaghyz* seeds were normal, differing in no way from the untreated controls; on the other hand, plants developing from treated seeds of *T. officinale* and *T. serotinum* were abnormal, having underdeveloped root hairs or none and sometimes with dying root tips. These findings suggested the possibility of purifying seeds of kok-saghyz from admixture with seeds of the nonrubber-bearing weed dandelions.

Translocation of copper ions in plants, E. M. DELF (*Nature [London]*, 157 (1946), No. 3994, pp. 666-668).—The results of experiments by the author and others suggested that the path and rate of travel of Cu ions are influenced by the specific nature of the plant and degree of differentiation of the tissues, apart from possible differences in the permeability and sensitiveness to Cu ions. Until more is known about such variations it is believed useless to continue comparing rates of travel in the phloem of different plants; the rapidity of the upward movement in *Impatiens* showed, however, that maxi-

imum rates can be obtained only by using very short time intervals after banding; thus the technic and timing of the operations are of first importance. Later the path of translocation in thalli of the brown algae *Fucus* and *Ascophyllum* was studied by use of a mixture of CuSO_4 , CaCl_2 , and soil. The results definitely pointed to an upward translocation of Cu ions (and presumably of other mineral ions) along the broader medullary filaments.

Studies on foliar hydration in the cotton plant.—VII, The size factor, T. G. MASON (*Ann. Bot. [London], n. ser., 10 (1946), No. 38, pp. 143-152, illus. 3*).—In this contribution (E. S. R., 94, p. 605), the author examines Richards' criticisms of the size hypothesis (E. S. R., 91, p. 656), pointing out that some of the nutrient solutions employed by Richards and Shih were probably toxic and consequently physiologically arid. Strong indications are presented that the size factor was operating in the plants grown in these solutions. Data are also presented as proof that the reversal in hydration found by Phillis and Mason cannot have been caused by differences in the mineral or carbohydrate levels of the leaves. It is also demonstrated that the size factor may operate when plants are grown under varying N supply. There are 16 references.

Specificity of potassium and magnesium for growth of *Aspergillus niger*, R. A. STEINBERG. (U. S. D. A.). (*Amer. Jour. Bot., 33 (1946), No. 3, pp. 210-214*).—When *A. niger* was grown in a dibasal solution (optimum yield solution of minimum salt content) for 4 days at 35° C., Na and Be gave increased yields with deficiencies in K and Mg, respectively ("biological substitution"). Increased macronutrients, micronutrients, acidity, or inoculum failed to eliminate the K/Na effect, but did cause increased growth with extreme deficiencies of K and a loss of specificity in the action of Na—i. e., positive effects were also caused by other alkali metals (Li, Rb, Cs). The K optimum (150 mg./l.) remained unaltered in all instances. Responses in the Mg/Be effect to these variations in the dibasal solution were similar (Ca, Sr, Ba), except for its elimination in the presence of increased micronutrients and of acidity. Increased macronutrients or inoculum did not lead to increased yields with extreme deficiencies in Mg. The Mg optimum (10 mg./l.) for maximum growth remained unaltered in all instances. Biological pseudosubstitutions (Li, Rb, Ca, Sr, Ba) were attributed to amelioration of inhibition (ion antagonism).

Growth and fruiting of certain ascomycetous fungi as influenced by the nature and concentration of carbohydrate in the medium, L. E. HAWKER and S. D. CHAUDHURI (*Ann. Bot. [London], n. ser., 10 (1946), No. 38, pp. 185-194, illus. 1*).—The effects of a range of concentrations of glucose, fructose, sucrose, maltose, starch, and lactose on the growth and fruiting of seven ascomycetous fungi were studied. Response to glucose or lactose was always of the same type, viz, mycelial growth increased with increase in sugar up to a relatively high concentration, while fruiting reached a maximum at a low concentration—varying with the species—above which it fell off rapidly. Responses to the more complex carbohydrates were of three types: (1) Similar to that of hexose sugars, (2) a starvation type of growth at low concentrations and a slight increase in both growth and fruiting with increased concentration, and (3) an intermediate type where growth and fruiting were poor at low concentrations but increased with increase in amount of carbohydrate until both were good. The type of response of three fungi to sucrose was correlated with the rate at which the sugar was inverted and with the amount of invertase produced per unit dry weight of mycelium. It is suggested that these differences in response can be partly but not entirely ex-

plained by differences in the rate at which a particular fungus can break down complex carbohydrates to hexose.

The nature of cellulose in *Sphagnum*, N. PLANK (*Amer. Jour. Bot.*, **33** (1946), No. 5, pp. 335-337).—Cross and Bevan cellulose was prepared from *S. recurvum tenuis*; the total amount of cellulose was also determined by a volumetric method. From the crude cellulose, a cellulose was prepared and the amounts of the β and γ forms were determined by a process outlined. The results indicated peat moss to be lower in the long-chain and pure glucose anhydride cellulose than samples of similarly investigated tissues of seed plants. Results of the cellobiose octaacetate preparation from the a cellulose obtained indicate that at least 3.8 percent of the carbohydrates present in *Sphagnum* cellulose are definitely glucosans and are linked together by the β 1,4 glycosidic linkage.

The nature and distribution of various forms of nitrogen in the potato, H. E. STREET, A. E. KENYON, and G. M. WATSON (*Ann. Appl. Biol.*, **33** (1946), No. 1, pp. 1-12, illus. 7).—As shown by determinations at intervals during active growth, each organ of the King Edward potato plant exhibited a unity in its nitrogenous composition throughout the season. The seed tubers were characterized by their high content of nonprotein N; this fraction yielded the greater part of the N withdrawn from the seed tubers, the amide, amino, and "other N" fractions all being markedly depleted. The severely depleted tubers retained some 20 percent of their initial N content. The roots were rich in nonprotein N, in which the nitrate was an important fraction; the roots from $(\text{NH}_4)_2\text{SO}_4$ -treated plots had a higher total N content than those from untreated plots, due to accumulation of NH_4 nitrogen. The "tops" had a higher N content and a higher proportion of protein than the roots. There was an increase in protein and a decrease in nonprotein N in passing from stems to petioles to leaf blades. The depleted tubers, roots, and stems had a uniform low-protein content of the order 0.4 to 0.6 mg. protein N per gram fresh weight. Asparagine and glutamine occurred in approximately equal amounts in the seed tubers and roots; glutamine was more completely withdrawn from the tubers than asparagine, and in the tops it constantly exceeded asparagine in amount. A study of the concentration gradients—from leaves to petioles to stems to stem bases and new tubers—of the fractions of nonprotein N focused attention on the "other N" as containing the organic N most actively involved in translocation. The concentration and total content of the glycoside solanine in the different organs was determined at each sampling.

Estimation and physiological role of solanine in the potato, M. J. WOLF and B. M. DUGGAR. (Wis. Expt. Sta.). (*Jour. Agr. Res. [U. S.]*, **73** (1946), No. 1, pp. 32, illus. 15).—The technics of extracting potato alkaloids from leaves and sprouts and their separation and purification are described, and some of their properties are discussed. In normal tubers, the highest concentration of solanine occurs in the peripheral zone comprising the periderm and cortical parenchyma; little or none is found in the pith and only small amounts in the intermediate region. From a survey of 32 varieties grown in Wisconsin during one season, the concentration ranged from about 2 to 13 mg. per 100 gm. of fresh tuber, while the tubers of *Solanum commersonii* had as much as 500 mg. per 100 gm. From tests with certain standard potato varieties it was found that in the new plants produced from tubers solanine can be synthesized in darkness, and only a slightly greater solanine production was observed in the light. In the darkness, it was fairly evenly distributed between aerial and subterranean parts; in the light it tended to

concentrate in the tops. Photoperiod affected both the synthesis and distribution of solanine. In a 10-hr. day, its content was 0.059 percent of the total dry weight as against 0.085 percent in an 18-hr. day. In the short day about 58 percent of the glycoside was found in the aerial portion as against 70 percent in the long day.

The percentage concentration of solanine in the tubers declined with advances in the season. In the early variety Irish Cobbler there was an abrupt drop early in the season, after which a low level was maintained. In the late variety White Rural there was an initial rise to a maximum which was maintained for about 2 weeks, followed by a drop. The slowly maturing Russet Burbank showed a steady decline in concentration throughout the season. In all three varieties, the total solanine per hill accumulated with time. Throughout the season, the highest concentration was maintained by the shoot tips. The leaves, exclusive of very young ones at the stem tips, were intermediate in concentration and in all cases showed an over-all drop. The concentration in the older roots was in most cases lower than that in the leaves. Expressed on a dry-weight basis, the solanine content of tubers and of aerial stems was approximately of the same order, and in both it remained relatively low throughout the season in all three varieties. In all varieties, by far the greater part of the solanine per hill was contained in the leaves. The total solanine curves for both leaves and shoot tips showed well-defined maxima; the total in aerial stems and in tubers was very low compared with that in other organs. Tubers are the only organs which showed a continuous accumulation throughout the season, exhibiting a slight but steady rise with time. Aerial stems displayed only minor fluctuations in alkaloid concentration. In all the varieties tested, there was a much greater loss of solanine from the tops than could be accounted for on the basis of transport to underground portions. In White Rural approximately 284 mg. disappeared from the tops, whereas the maximum solanine content of tubers was only about 36 mg. The glycoside is apparently metabolized toward the end of the growing season. Leaves of *S. commersonii* had a solanine concentration of about 2.6 percent on a dry-weight basis and showed no appreciable variation in concentration between July and September.

The evolution of oxygen from illuminated suspensions of frozen, dried, and homogenized chloroplasts, C. S. FRENCH, A. S. HOLT, R. D. POWELL, and M. L. ANSON. (Univ. Minn. et al.). (*Science*, 103 (1946), No. 2678, pp. 505-506).—This note summarizes some of the data obtained on the activity of chloroplast preparations treated in various ways. The findings indicate that after freezing, drying, thorough disintegration, or precipitation by ammonium salts, the chloroplasts still retain considerable activity. This study shows further that the ability to produce oxygen is a property not only of intact chloroplasts but also of material exposed to some of the conditions that would be necessary in attempts to fractionate the enzymes involved in the reaction by which O_2 is produced.

Further studies on plastid variegations, M. W. WOODS and H. B. DUBUY. (Univ. Md.). (*Amer. Jour. Bot.*, 33 (1946), No. 3, p. 225).—An abstract.

Aerosol OT in the preparation of microscopic mounts of fungi, A. J. WHIFFEN (*Mycologia*, 38 (1946), No. 3, p. 346).—The aerosol OT solution has served not only as a wetting agent but also as a mounting medium which is readily miscible with the lactophenol mixture commonly used in preserving temporary mounts.

Staining the chromosomes of yeast by the Feulgen technique, M. K. SUBRAMANIAM and B. RANGANATHAN (*Nature* [London], 157 (1946), No. 3994, p. 657, illus. 9).

Fibrillar structure of cellulose of bacterial and animal origin, M. ASCHNER and S. HESTRIN (*Nature [London]*, 157 (1946), No. 3994, p. 659).—That the cell wall of green plants has a fibrillar structure has been demonstrated. Since bacterial cellulose (*Acetobacter xylinum* zooglea) and animal cellulose (tunicin) may be assumed to be formed under conditions differing radically from those involved in cell-wall deposition in plants, it was deemed of interest to study the microscopic structure of these natural cellulose membranes. They also were found to have a fibrillar structure.

Further consideration of glandular leaf hairs of tobacco and of their significance, F. A. WOLF (*Bul. Torrey Bot. Club*, 73 (1946) No. 3, pp. 224–234).—The results of further study (E. S. R., 93, p. 697) reveal that hairiness can be increased by hybridization and/or selection. Additional evidence is presented that hairiness is modified in response to spacing practices and to light. These findings indicate that—to a degree—both the volume and quality of aroma are controllable, that all varieties of oriental tobacco may not produce the largest yield and best quality if spaced alike, and that analysis of hairiness seems to provide a means of determining proper spacing and fertilizer practices. There are 14 references.

Structural composition of the sclereids in the integument of *Pisum sativum* L., R. M. REEVE. (U. S. D. A.). (*Amer. Jour. Bot.*, 33 (1946), No. 3, pp. 191–204, illus. 19).—Problems of texture constitute a major field of technological investigation in the commercial production of vegetables as food. The causes of texture changes in the seed coats of beans and peas intended for freezing and canning involve biological variables as well as the effects of harvesting, handling, and processing. In the present study, histochemical methods for detecting pentosans in the walls of “hemicellulosic” tissues in seed plants were developed by adaptation of reagents that yield characteristic color products of condensation with pentoses; differentiation between lignin and pentosan reactions was accomplished.

With these methods it became possible to detect the presence of pentosans in the secondary wall thickenings of the macrosclereids and the osteosclereids in the integuments of peas and lima beans. Also, color differentiation between these components and the polyuronides of the middle lamellae was obtained. Arabinose and xylose were tentatively identified as sugars of the pentosan-cellulose complex of the secondary walls; galactose, galacturonic acid, and possibly arabinose apparently occurred as constituents of the middle lamellae pectins. The “light line” of the macrosclereids is considered merely a phenomenon of light refraction, its only significance to composition and textural characteristics of the maturing epidermis lying in the fact that it is caused by the thickened walls. The crystallite orientation paralleled the cellulosic fibrils in both the macrosclereids and the osteosclereids. Observations made on acid-swollen tissues agreed with optical properties as determined with polarized light; there was also agreement with the interpretations of the histochemical tests in relation to wall structure. Further agreement exists between the observations and interpretations recorded here and other published information (37 references) on the chemical composition, optical properties, and structural characteristics of the walls of plant tissues. The relationships of wall structure and texture to problems in commercial food preservation are briefly discussed: The tissue characteristics of texture and permeability are related to the pentosan-cellulose complex of the secondary walls in the macrosclereids; the cuticle may also affect permeability but bears little relationship to texture.

GENETICS

Fifty years work as agricultural explorer and plant breeder, N. E. HANSEN. (S. Dak. State Col.). (*S. Dak. State Hort. Soc., Ann. Rpt.*, 42 (1945), pp. 119-137).—The author reviews his work as an agricultural explorer and plant breeder, the occasion being the awarding of a medal to him by the Iowa State Horticultural Society (November 17, 1944).

Radiation and living cells (*Nature [London]*, 157 (1946), No. 3996, pp. 738-739).—Review of a symposium held at the British Institute of Radiology (May 13-14, 1946) on the general subject "Certain Aspects of the Action of Radiation on Living Cells," and dealing with inactivation of viruses, radiation and dilute aqueous solutions, action of radiation on chromosomes, and radiation and germ cells.

Chromosome atlas of cultivated plants, C. D. DARLINGTON and E. K. JANAKI AMMAL (London: George Allen & Unwin, 1945, pp. 397).

Artificial and natural hybrids in the Gramineae, tribe Hordeae.—I, Elymus, Sitanion, and Agropyron, G. L. STEBBINS, JR., and J. I. and R. M. VALENCIA. (Univ. Calif.). (*Amer. Jour. Bot.*, 33 (1946), No. 5, pp. 338-351, illus. 14).

Cytology of cereals, II, H. C. AASE. (Wash. State Col.). (*Bot. Rev.*, 12 (1946), No. 5, pp. 255-334).—In this comprehensive supplemental review (599 references) the discussion considers euploid chromosome aberrations; chromosome morphology and genom relationships; aneuploid and structural chromosome aberrations; asynapsis, desynapsis, or dissociation; sterility; polyploidogenic, etc., agencies; embryo sac, embryo, and endosperm; vegetative grafts; and mitotic periodicity. The first decade—freely speaking—of intensive work in the cytology of "small grain" cereals and closely related grasses may be characterized mainly by determination of chromosome numbers in supposedly well-established races and species and by description of general chromosome behavior in a number of varietal, specific, and generic hybrids. The second—or immediately past—decade and the "sundry burden" of this review has become progressively more marked by increased artificial induction of disturbances of the apparently stable state of nature or—perhaps more exactly—by attempts to speed up the slow processes of evolution. "A rugged stability on one hand is yet highly susceptible to change which often manifests itself cytologically as chromosome aberrations, numerical and structural."

Correlated inheritance of stem rust reaction, nitrogen content of grain, and kernel weight in a barley cross, A. J. LEJEUNE (*Sci. Agr.* 26 (1946), No. 5, pp. 198-211, illus. 6).—In the variety cross O. A. C. 21 × Chevron, inheritance of reaction to stem rust is governed by a single factor pair, with resistance dominant. Evidence was found that one or more minor factors modify the reaction of the resistant offspring toward susceptibility; the effect of such modifying factors is, however, of no practical significance. Inheritance of N content in the same cross is governed by multiple factors, with a tendency for the N to be higher in F₂ than in the parents genetically comparable for the stem rust factor. Inheritance of kernel weight is also governed by multiple factors, in this case with a definite tendency toward lower kernel weight in the F₂ than in the parents genetically comparable for the stem rust factor. Few or none of the factors for N content are directly associated or linked with the factor for stem rust reaction; some of these factors, however, are apparently associated with it indirectly through its relation to kernel weight. This indirect relationship results in a weak association of high N content with

resistance of stem rust. A large proportion of the factors for 1,000 kernel weight appeared to be linked with the factor for stem rust reaction; this linkage was fairly close and resulted in the association of resistance with low kernel weight, but was broken when a much larger population was employed. In a breeding program to produce stem rust-resistant barley with good malting quality—using Chevron or possibly Peatland as the resistance source—it would be advisable to grow much larger populations than would be needed if no linkage existed between kernel weight and the stem rust factor. There are 13 references.

Trigeneric hybrids Elymus × wheat × rye, V. E. PISSAREV and N. M. VINOGRADOVA (*Compt. Rend. (Dok.) Acad. Sci. U. R. S. S., n. ser., 49 (1945), No. 3, pp. 218–219*).—The authors report successful crosses of rye-wheat amphidiploids with *E. arenarius*.

Inheritance of indeterminate growth in maize, W. R. SINGLETON. (Conn. [New Haven] Expt. Sta.). (*Jour. Hered., 37 (1946), No. 2, pp. 61–64, illus. 2*).—An indeterminate corn plant, found in the C31 sweet corn inbred, is a simple mendelian recessive *id*. In segregating progenies of *id*/+ plants, the F₂ generation gives 3+ : 1 *id* as is expected. A slight but probably not significant excess of *id* plants occurs. No linkage has been found.

Photoperiodism and sex in Zea mays, R. S. CHOUDHRI and R. KRISHAN (*Indian Acad. Sci. Proc., 23 (1946), No. 2, Sect. B, pp. 73–78, illus. 3*).—The effects of 6, 12, 18, and 24 hr. of daily light on sex expression in corn plants grown under low (normal) N and high (additional) N were investigated. The 12-hr. photoperiod plants were characterized by normal ♂ and ♀ flowers; under 6-hr. light periods there was a conspicuous change in the tassels, many spikelets taking on ♀ forms leading to grain formation; under long photoperiods, reversal took place in the ears, where a good many ♂ spikelets developed in place of the ♀ ones. A slight change from staminate to pistillate characters also occurred under the long photoperiods, and is explained on the basis of greater stability of the ♀ over the ♂ characters in corn. Sex modifications were also initiated by heavy N nutrition, which accelerated the change from ♂ to ♀ in the tassels but caused a relative inhibition of sex reversal in the ear.

Secondary association and heterochromatic attraction.—I, Cicer arietinum, P. T. THOMAS and S. H. REVELL (*Ann. Bot. [London], n. ser., 10 (1946), No. 38, pp. 159–164, illus. 11*).—No difference in the chromosome number of a “normal” and a gigas type of gram chickpea (*C. arietinum*)—reputed to have 14 and 16 respectively—could be observed; though genetically distinct, both had 16 chromosomes. The chromosome complements of both were morphologically similar, but an extra fragment was seen at meiosis in some plants of the normal type. The haploid chromosome complement consists of 2 large chromosomes—distinguishable from each other, 5 medium, and 1 small chromosome. The detailed results of the study are presented. In the diploid, analysis of secondary association need not indicate chromosome relationship whereas in the tetraploid it may do so, depending on (1) the degree of prezygotene orientation and (2) the amount and distribution of heterochromatin.

Albinos in pinto beans, G. N. STROMAN. (N. Mex. Expt. Sta.). (*Jour. Hered., 37 (1946), No. 2, pp. 59–60*).—Albinos appearing in pinto beans apparently were caused by a recessive gene, with a possibility of modifying factors.

Karyotype evolution: A cytogenetic study of seven species and six interspecific hybrids of Crepis, M. SHERMAN (*Calif. Univ. Pubs. Bot., 18 (1946), No. 17, pp. 369–407+, illus. 37*).

Tetraploid *Taraxacum kok-saghyz*.—II, Characters of F_1 plants grown in pots, M. W. BANNAN (*Canad. Jour. Res.*, 24 (1946), No. 3, Sect. C, pp. 81–97).—In the present study (E. S. R., 94, p. 43), F_1 tetraploids grown in pots had larger but fewer leaves and inflorescences than control diploids. Increase in size of organs was offset by reduction in numbers, so that leaf area was no greater and the total number of florets per plant was much lower in the tetraploids. Fertility varied inversely with genetic relationship and was much reduced in the tetraploids. No significant differences in root size were noted. The tetraploids grew somewhat more slowly than the diploids but for a longer time, and, on the whole, plants with the largest rosettes developed the largest roots also. Sibling tetraploids exhibited less deviation from the mean than randomized plants in such characters as number, size, and shape of leaves, production of heads, and weight of roots. Leaf characters provided the clearest evidence of an inheritance mechanism; the data on root weight were less conclusive.

A cytological basis of sterility in *Tripsacum laxum*, K. S. DODDS and N. W. SIMMONDS (*Ann. Bot. [London]*, n. ser., 10 (1946), No. 38, pp. 109–116, illus. 11).—The chromosome number of *T. laxum* (Guatemala gamagrass) was confirmed as $2n = 72$. Most chromosomes were associated as bivalents, but there were irregularities of association, congression, and separation resulting finally in δ sterility. Bridges were not seen at first anaphase; their occasional occurrence at second anaphase is interpreted as a consequence of chromatid fusion.

On heterosis effects in *Triticum vulgare*, I. GRANHALL (*Hereditas*, 32 (1946), No. 2, pp. 287–293).—In two wheat crosses the author found the heterozygous half-bearded F_1 plants averaging more vigorous than corresponding beardless and bearded groups. In the first case, two very different spring wheats—Hindi and Extra-Kolben II—were crossed; in the other, a winter wheat—Pansar—and its bearded mutant were used as parents. The findings provide strong indications of pleiotropic effects of the beardless factor or absolute linkage between this morphological factor and quantitative physiological genes. The second cross—where the parents differed only monofactorily—gives a clear demonstration of real heterosis stimulation. In the cross of two very different varieties, the average number of culms of the F_1 plants failed to reach the mean of the two parents; in the other cross—where the parents differed in only a single factor (or factor complex)—the corresponding differences in vitality were numerically very small and quite insignificant, in accordance with expectations. As to plant height, the average of F_1 from the first cross was higher than the mean of the two parents. This is explained by assuming that one of the parents (Extra-Kolben II) includes some strongly dominant length factors, whereas the other parent (Hindi) has the recessive alleles.

The effect of heterozygosity on variability and vigour, A. GUSTAFSSON (*Hereditas*, 32 (1946), No. 2, pp. 263–286).—The author reviews previous results along this line in plants and animals (22 references) and presents some further cases of monohybrid heterosis in barley. The series of data given are believed to show that mutations lethal in the homozygous condition may increase viability when they occur in the single dose. Vigor may also be affected in a general sense: In some plants the reproductive capacity is increased along with properties such as length of culm or head and ability to tiller. Heterozygous seeds of the barley mutation *albina* 7 kept their germinating capacity longer than the homozygous seeds; this was especially conspicuous in medium strong and strong plants. A tendency existed to

increase the range of variation in mono- and di-hybrids as compared with the homozygous sister plants. Some of the problems on population dynamics and inbreeding degeneration are discussed briefly.

The genesis of some Scandinavian species of *Calamagrostis*, A. NYGREN (*Hereditas*, 32 (1946), No. 2, pp. 131-262, illus. 235).—A comprehensive report covering results of cytological studies of *Calamagrostis* spp., analytical studies of populations of both amphimictic and apomictic species, isolation and crossing experiments, analysis of pollen and pollen germinability, and cytological studies of F_1 hybrids between different amphimictic *Calamagrostis* spp. Literature cited includes 158 references.

Maintenance of heterozygosity in a homothallic [fungus] species of the *Neurospora tetrasperma* type, E. R. SANSOME (*Nature [London]*, 157 (1946), No. 3989, pp. 484-485, illus. 2).

Reverse-mutation and adaptation in leucineless *Neurospora*, F. J. RYAN and J. LEDERBERG (*Natl. Acad. Sci. Proc.*, 32 (1946), No. 6, pp. 163-173, illus. 3).—On the basis of the evidence presented, it is concluded that the reverse mutation to the wild-type allele does occur. The leucineless mutant of *N. crassa* is a true mutation. The adaptation to leucine independence which this mutation sometimes undergoes is due to back mutation to the wild-type condition at the leucineless locus. This was demonstrated by the genetic behavior of the adapted strain in crosses with leucineless and by the genetic behavior of the leucine-independent F_1 progeny in crosses with the wild type. Moreover, the adapted and wild-type strains proved to be physiologically identical. The incidence of adaptations was significantly higher in the presence of low than of high concentrations of leucine. This apparent chemical induction of mutations has its explanation in the fact that a back mutation in the leucineless strain always resulted in the formation of a heterocaryon. In a heterocaryon between the leucineless and the adapted or wild-type strains, the leucineless nuclei have an advantage in the presence of leucine. Whether a back mutation will result in an adaptation depends on whether conditions favor selection against the leucine-independent nuclei.

Inherited differences in sensitivity to radiation in *Escherichia coli*, E. M. WITKIN (*Natl. Acad. Sci. Proc.*, 32 (1946), No. 3, pp. 59-63, illus. 2).—A strain of *E. coli* yielded variants characterized by resistance to both ultraviolet and X-ray irradiation and detected by the selective action of these radiations; this resistance proved to be a stable heritable property. A technic is described by which the number of resistant bacteria in samples from normal cultures can be accurately determined. The change from sensitivity to resistance is said to be a spontaneous mutation in normal cultures at a rate of about 1×10^{-8} mutations per bacterium per generation. Ultraviolet doses that inhibit cell division for several hours in sensitive bacteria—resulting in the production of elongated cells—did not appreciably inhibit division in resistant bacteria. Curves of survival in sensitive and resistant bacteria as a function of ultraviolet and X-ray doses are compared. Certain features of these findings are discussed.

Genetical factors concerned in the symbiosis of clover and nodule bacteria, P. S. NUTMAN (*Nature [London]*, 157 (1946), No. 3989, pp. 463-465).—A brief review (6 references) and account of preliminary experimental results suggesting that "resistance" is inherited as a recessive in conjunction with a possibly cytoplasmic maternally transmitted component. The general conclusion is that the number and activity of nodules formed on the plant depend on the interaction of factors—in bacteria and plants—both liable to change by mutation. It was also evident that critical studies of symbiosis demand the

use of clonal lines of bacteria, as well as a much fuller knowledge than now available on the inheritance and activity of the coordinating factors in the plant. The relationship between the two organisms would seem to be much more complex than is generally supposed. On the practical side it is shown that with a strain of bacteria normally giving a response intermediate in effectivity toward plant material of mixed genetical constitution, selection to increase the effectivity of response is possible; thus far selection for responsiveness to native totally ineffective strains of bacteria has been unsuccessful, so that the problem of these strains must apparently be dealt with from the bacteriological side.

Animal breeding, A. L. HAGEDOORN (*London: Crosby Lockwood & Son, 1946, 2. ed., pp. 304, illus. 29*).—This edition (E. S. R., 82, p. 754) adds "a few things, especially some examples taken from the results of my own experimental work during the war years."

Genetics of the Palomino horse, W. E. CASTLE. (Univ. Calif.). (*Jour. Hered.*, 37 (1946), No. 2, pp. 35-38, illus. 4).—Data are presented which the author interprets as confirming the Salisbury-Britton hypothesis as to the Palomino coat color (E. S. R., 86, p. 313).

Cross-breeding with dairy cattle, M. H. FOHRMAN. (U. S. D. A.). (*Amer. Milk Rev.*, 8 (1946), No. 6, pp. 34, 36-38, illus. 4).—A preliminary report is given on production records obtained in an experiment in cross-breeding begun in 1939 and including Holsteins, Jerseys, Guernseys, and Red Danes. A summary of the records completed by 32 two-breed and 5 three-breed cows showed an average of 13,095 lb. of milk and 599 lb. of milk fat at the average age of 2 yr. 2 mo. A discussion of the possibilities for expanding the usefulness of registered cattle through the commercial application of cross-breeding of dairy cattle is included.

The colostrum pregnancy test in cattle, C. F. CAIRY. (Mich. Expt. Sta.). (*Amer. Jour. Vet. Res.*, 6 (1945), No. 21, pp. 252-256, illus. 1; *abs. in Michigan Sta. Quart. Bul.*, 28 (1946), No. 4, pp. 360-361).—The results are presented of 322 colostrum injections with 35 cows and of 17 with 2 freemartins. The "colostrum" used was not the postpartum or true colostrum, but the material which accumulates in the udder before parturition in first-calf heifers. Several samples were used in various amounts and different dilutions.

Analysis from the standpoints of the response of individual cows, the antigen used, the amount injected, and the dilution used indicated that while there appeared to be marked differences in the responses of some animals to certain antigens, the test is not of sufficient accuracy in the bovine to be used as a pregnancy test. It seemed that the variations in responses to the test were due not so much to the differences between antigens, dilutions, and the amounts injected as to differences between the individual cows. However, certain individual cows responded with an accuracy of better than 90 per cent.

Mitotic activity in the adult female mouse *Mus musculus* L.: A study of its relation to the oestrous cycle in normal and abnormal conditions, W. S. BULLOUGH (*Roy. Soc. London, Phil. Trans., Ser. B*, 231 (1946), No. 535, pp. 453-516 +, illus. 38).—A survey has been made of the mitotic activity of the reproductive system, the urinary system, the alimentary canal, various exocrine and endocrine glands, and other miscellaneous organs of nearly 500 adult female mice, both in relation to the normal estrus cycle and to injections of estrone. A similar survey has also been made of the mitotic activity associated with wound healing and with cancerous growth.

It is concluded that in the adult female mouse, and probably in other animals, there exist three types of substances influencing mitotic activity. First, there are the estrogenic hormones which act as general mitosis stimulators; second, there are the mitosis-inhibiting forces of cell inertia and mitosis depression, which prevent the rate of cell division from becoming excessive and unregulated; and third, there are the wound hormones which, by weakening the mitosis-inhibiting forces, allow an abnormally high reaction to estrogen stimulation and a consequent rapid production of new tissue to meet the emergency. This conclusion is discussed in relation to several biological problems, including ovarian function, pregnancy, embryonic growth, and cancer.

The inbred hybrid, J. H. MARTIN. (Purdue Univ.). (*Hatchery Tribune and Feed Retailer*, 20 (1946), No. 7, pp. 21, 60-64, illus. 1).—This is a brief review of experimental work with inbreeding and hybridization in poultry. It is stated that "the answer to the future of the hybrid chick rests in the hands of the poultry breeders who are willing to take the hazards involved in an inbreeding program."

Production of strophosomy in the chick embryo by local applications of colchicine, M. L. GABRIEL. ([Conn.] Storrs Expt. Sta.). (*Jour. Expt. Zool.*, 101 (1946), No. 3, pp. 351-354, illus. 4).—The embryonic area of chick embryos of 25-28 somites was explored by treatment with narrow bands of colchicized agar. The results obtained indicated that the region between the omphalomesenteric vessels and the hind limb buds is most susceptible to the induction of strophosomy.

The effect of local applications of colchicine on Leghorn and polydactylous chick embryos, M. L. GABRIEL. ([Conn.] Storrs Expt. Sta.). (*Jour. Expt. Zool.*, 101 (1946), No. 3, pp. 339-350, illus. 4).—A method has been described for treating localized regions of the chick blastoderm with colchicine soaked up on neutral-red stained agar films. Colchicine, in concentrations of 0.0001-0.0005 gm./cm.² thus applied, produces local defects pointing to high determination of the hind limb at the 25-somite stage, strophosomic embryos, and dwarfed limbs. The significance of the experimental production of defects and dwarf limbs for the problem of polydactylism is discussed. The hypothesis is advanced that polydactylism is not the result of added halluces, but is the partially inhibited expression of a duplicated limb field.

The effects of hypothermia upon the reproductive tract of the hen, P. D. STURKIE. (N. J. Expt. Stas.). (*Poultry Sci.*, 25 (1946), No. 4, pp. 369-372).—Hypothermia was induced in over 100 White Leghorn females, at varying intervals up to 9 hr. after laying, by submerging the birds up to the neck in water of the appropriate temperature. The subnormal-body temperature, which varied from 83° to 102° F., was maintained for 1 to 14 hr. When the treatments were terminated the birds were removed from the cold bath, placed in warm water, and then dried in a forced-draught incubator at a temperature of 99.5°. In most cases, those hens which had eggs in the uterus when the body temperature was subnormal laid their eggs prematurely (soft-shelled), whereas most of the hens which had regained normal body temperature before the egg entered the uterus laid hard-shelled eggs. The time of laying of the hard-shelled eggs was delayed. The hypothermia did not hinder ovulation, and it probably had little, if any, effect upon the rate of passage of ova to the uterus.

Hatchability in relation to consanguinity of breeding stock in turkeys, M. A. JULL and R. E. PHILLIPS. (Md. Expt. Sta.). (*Poultry Sci.*, 25 (1946), No. 4, pp. 312-319).—Results are tabulated of the infertility and hatchability

percentages obtained with outbred Black hens and heterozygous Black hens mated to outbred Black toms, Beltsville Small-Type White hens mated to Beltsville Small-Type White toms or an outbred Black tom, outbred Black Hens and heterozygous Black hens mated to a heterozygous (three-fourths) Black tom, and Beltsville Small-Type White hens mated to a Beltsville Small-Type White tom (their sire the previous year) or to an outbred Black tom.

The results secured from these various matings indicate that "hatchability among female progenies is influenced more by the heritable hatchability of parents than by the particular kind of mating. For the most part, outbred, mildly inbred, and crossbred matings gave comparable results with respect to percent hatchability of fertile eggs. Inbreeding, involving matings of brother $\times$ sister, son $\times$ dam, and sire $\times$ daughter, produced satisfactory results when parents were selected on basis of heritable hatchability. The importance of selecting breeding stock on the basis of the dam's family average hatchability is clearly demonstrated."

The environmental conditions affecting the genetic mechanism of wing production in the chrysanthemum aphid, W. S. WHITE (*Amer. Nat.*, 80 (1946), No. 790, pp. 245-270).—Approximately 29,000 chrysanthemum aphids (*Macrosiphum sanborni*) were reared under controlled conditions to study the effect of light, temperature, wilting of the host plant, presence or absence of wings in the parents, and environment of the stock on wing production. Every one of the factors tested had a noticeable influence, but "weighting of their effects would assign the greatest influence to the light conditions prevailing during the experiment. Second place would be given to the temperature used during the experiment. The environment of the stock from which the experimental animals were drawn is third in importance, followed by the presence or absence of wings in the parent aphids. The least effective of all the agents tested was the condition of the host plant, whether wilted or fresh."

FIELD CROPS

[Farm crops research in Mississippi] (*Miss. Farm Res. [Mississippi Sta.]*, 9 (1946), No. 2, pp. 1, 5, 8).—Articles reporting results of experiments with farm crops are entitled: Effect of Crop Rotation on Cotton Yield Tested at State College and Holly Springs, by R. Coleman and S. P. Crockett (pp. 1, 5); and Time of Applying Nitrogen Materials in Delta Oats Test, by J. Pitner (p. 8).

Grasses and cultural methods for reseeding abandoned farm lands in southern Idaho, R. H. STARK, J. L. TOEVS, and A. L. HAFENRICHTER. (Coop. U. S. D. A.). (*Idaho Sta. Bul.* 267 (1946), pp. 36, illus. 10).—Grasses and grass mixtures, methods of preparing seedbeds, and methods and dates of seeding were compared 1939-44 on typical eroded abandoned land in southern Idaho. Relative costs and returns were computed. Summer-fallowing, found the best method of preparing abandoned land for seeding, reduced competition from annual cheatgrass and weeds, eliminated sagebrush, rabbitbrush, and poisonous plants, and made possible good, uniform stands of perennial grasses from spring seeding as well as from fall planting. Seedings on summer fallow developed to full production one and two years earlier than those on other seedbeds. Various types of grasses were established successfully on summer-fallowed abandoned land. Several kinds of drills were used with equal success. Other methods of seedbed preparation resulted in satisfactory stands of crested wheatgrass and bluebunch wheatgrass from fall plantings. Duckfooting just prior to seeding resulted in good establishment, but stands

were retarded in reaching full production. Where cheatgrass containing some sagebrush and rabbitbrush was burned to prepare land, good stands were obtained from fall seedings. Stands of perennial grasses seeded in cheatgrass without seedbed preparation were erratic.

Acre costs of preparing seedbeds by summer fallowing have averaged \$1.10, duckfoot cultivating \$0.30, and burning \$0.19. Drilling has averaged \$0.35 per acre; taxes and interest vary with the locality, and cost for seed varies with the kind and amount used and market fluctuations. Return from summer fallowing would easily offset the additional cost for a method of seedbed preparation that assured stands and provided one or two more years of full grazing use.

The beet drill produced the most uniform stands, but single-disk, double-disk, and deep-furrow drills were entirely satisfactory. When seeding directly into cheatgrass without seedbed preparation, deep-furrow drills gave the better results, and stands were more uniform. There were no significant differences in yield due to type of drill, and none attributable to differences in depth of seeding within the limits from $\frac{1}{2}$ in. on land with no preparation to $2\frac{1}{2}$ in. on seedbeds prepared by duckfooting. The beet drill gave positive uniform depth control, and uniformity of stands was exceptionally good. Uniform seeding depth was accomplished with other drills by a moderate and uniform rate of speed when seeding. Shallow rod-weeding of summer fallow just before planting facilitated depth control and provided uniform seeding conditions. Fall and early spring seedings of crested wheatgrass, and usually of bluebunch wheatgrass, did not differ much in yield.

Native and exotic wheatgrasses and native bluegrasses were best adapted. Improved strains of native bluebunch wheatgrass and introduced tall wheatgrass gave about the same grazing capacity per acre as crested wheatgrass when stands reached full production. The 3 bunch wheatgrasses have different seasons of use. Tall wheatgrass was the latest of all, and extended the grazing season as much as 30 days into the rainless summer months after the other grasses were dry and fibrous. Bluebunch wheatgrass was 2 weeks later than crested wheatgrass. The season for use for western wheatgrass corresponded to that of bluebunch wheatgrass, and that for thickspike wheatgrass to crested wheatgrass. By seeding separate pastures to grasses with different season of use, the grazing season was extended by 4 to 6 weeks. Crested wheatgrass reached full production on summer fallows by the end of the third growing season, bluebunch wheatgrass in the fourth season, and tall wheatgrass in the fifth season.

Selected strains of native western wheatgrass and thickspike wheatgrass did not differ in grazing capacity for seedings of the same age. Each required 1 yr. more than did crested wheatgrass to reach full production. When these sod-forming grasses were fully developed, the grazing capacity did not differ from that of bunch-type wheatgrasses. "Streambank" wheatgrass, a dwarf form of thickspike wheatgrass, adapted to rigors of soil and climate but low in grazing capacity, was easy to establish and reached full production as soon as crested wheatgrass.

Mixtures had no advantage in production over pure stands. In mixed alternate-row seedings of perennial grasses, sod-forming grasses tended to spread to an optimum density where bunchgrasses were thin. If sod and bunchgrasses are seeded together, those having similar season-of-use should be combined; crested wheatgrass should be planted with thickspike wheatgrass and bluebunch wheatgrass with western wheatgrass. Streambank wheatgrass can be used with either bunchgrass to provide understory ground cover. A

good combination of grasses was the alternate-row seeding of Michel rye with the wheatgrasses, with the rye harvested for hay the year after seeding.

Seedbed preparation by fallowing, cultivating, or burning reduced cheatgrass prevailing on the area, which made conditions favorable for establishment of perennial grasses. Good, uniform, and mature stands of adapted perennial grasses had basal densities averaging 2.67 percent and varying from 2.0 percent to about 4.0 percent, and the average acre production was 1,173 lb. Cheatgrass stands having basal densities between 2.0 and 4.0 percent, averaging 2.64 percent, made an average of only 607 lb. This emphasizes the relative merits of these grasses and shows the importance of good stands of perennial grasses to production and grazing capacity.

Two new grasses, Mandan wildrye and green stipagrass, G. A. ROGLER. (Coop. U. S. D. A.). (*North Dakota Sta. Bimo Bul.*, 8 (1946), No. 5, pp. 11-12).—Mandan wild-rye, selected from Canada wild-rye (*Elymus canadensis*), is characterized by ease of establishment, rapid growth, high yields of seed and forage, value in mixture with other grasses, wide adaptation, especially on sandy soils, endurance of grazing, and superior resistance to rust. The plants are finer, shorter, and leafier than in ordinary Canada wild-rye, and are longer lived than many strains.

Green stipagrass, an improved variety of feather bunchgrass (*Stipa viridula*), also selected at Mandan, surpasses ordinary feather bunchgrass in vigor, size, and forage yields, and seed yields are satisfactory. This variety, one of the highest yielding of the cool-season grasses tested at Mandan, makes very rapid growth after defoliation and is especially useful for pasture seedings. It grows well with other grasses and should be seeded in mixtures for general farm use. It thrives on most soil types and probably can be grown successfully over most of the northern Great Plains.

Classification of barley varieties grown in the United States and Canada in 1945, E. ÅBERG and G. A. WIEBE. (Coop. Univ. Wis.). (*U. S. Dept. Agr., Tech. Bul.* 907 (1946), pp. 190, illus. 93).—Commercial varieties of barley grown in the United States and Canada and those used extensively in breeding and of special interest, a total of 90 spring and 50 winter varieties, are classified and described, and many are illustrated with notes on history and distribution. Species of barley (*Hordeum* spp.) are discussed. The main ecological barley groups grown in these countries are discussed from the viewpoints of origin, distribution, characteristics, and breeding. The botany of the barley plant and the characters found in each plant part are described and illustrated with discussion of each character's stability under different environmental conditions and its value for use in classification. Determinative keys include one for all spring varieties, another for all winter varieties, two regional keys for grown spring barleys covering the two major ecological groups, and a key for identifications from threshed grain of important commercial spring barleys.

Bay, a new barley variety, J. W. THAYER and E. E. DOWN (*Michigan Sta. Quart. Bul.*, 28 (1946), No. 4, pp. 270-271).—Bay, a new variety selected from Minnesota 450 × Spartan barleys and released in 1945, has stiff straw, erect 6-rowed heads, and smooth awns, makes good yields, and is as acceptable for malting purposes as Wisconsin Barbless (Wisconsin 38), and possibly superior in certain respects.

Birdsfoot trefoil (*Lotus corniculatus* L.), its characteristics and potentialities as a forage legume, H. A. MACDONALD ([*New York*] *Cornell Sta. Mem.* 261 (1946), pp. 182, illus. 48).—Characteristics of birdsfoot trefoil and its development from seed germination to maturity are discussed, and attention

is given to its history, distribution, and world adaptation. Experiments 1938-43 dealing with the growth and habit of the plant, its soil fertility and ecological requirements, culture, seeding, and management, its production for hay, pasture, and seed, and its other uses and limitations, are reported together with results of a survey covering the plant's indigenous occurrence in New York. The bibliography comprises 342 references.

Birdsfoot trefoil, a long-lived perennial, was slow to establish, and may be injured severely by unfavorable conditions in the seeding year. When well established it was found adapted to a wide range of soil types and soil-moisture conditions. The narrow-leaved variety (*tenuifolius*) was better suited to moist situations than was the broad-leaved type (*vulgaris*). For N fixation, birdsfoot trefoil required a symbiotic *Rhizobium* species different from other common legumes. Response to fertilizer resembled that of other agricultural legumes, although birdsfoot trefoil persisted and produced at lower soil fertility levels than did other forage legumes. Its soil-lime requirement was less than that for alfalfa. Differences in response to various soil factors of the legumes tested were apparently correlated with variations in type of root system. The deep root system of birdsfoot trefoil, together with its profuse branching in the upper soil zone, appeared to give it a distinct advantage over a wide range of conditions. After establishment, it was more drought-resistant than were such shallow-rooted legumes as white clover.

Spring seeding of birdsfoot trefoil in the vicinity of Ithaca, N. Y., was superior to fall seeding, and seedings to a depth of from 0.25 to 0.5 in. gave results superior to those from shallower or deeper seedings. No improvement in yield came from seeding more than 5 lb. per acre. Where there were good soil preparation and favorable growing conditions, use of a cereal companion seeding retarded seedling establishment of birdsfoot trefoil. When used, a lower than normal rate of seeding of the companion crop was desirable.

Birdsfoot trefoil, normally lower-yielding for hay than alfalfa on soils adapted to alfalfa, was the better on soils unsuited to alfalfa. Red clover normally outyielded it in the first harvest year, but did not persist thereafter in appreciable quantity, as did the trefoil. The stem of birdsfoot trefoil was found to be weak, and its seeding with a strong supporting grass to prevent lodging was found desirable. Plants offering excessive competition in mixtures with birdsfoot trefoil were distinctly detrimental to its maximum production.

For pasture, birdsfoot trefoil gave best results when seeded with an open sod-producing grass, notably with Kentucky bluegrass, timothy, or orchard grass. It compared favorably with wild white clover and maintained fall greenness for several weeks after the other legumes had been severely injured and defoliated by frost. Birdsfoot trefoil was about as palatable as other legumes of similar nature and stage of maturity. Insofar as N, Ca, P, and lignin are concerned, this trefoil is equivalent in nutritive value to alfalfa for hay and white clover for pasture. Its cyanophoric properties varied, but no harmful effect was produced nor HCN poisoning found where stock fed upon it.

Production of seed of birdsfoot trefoil presented a major problem, retarding its use as an agricultural crop, for the mature pod shattered readily, necessitating great care in handling to prevent undue seed loss. Few insects or diseases were found to seriously affect the plant. A number of superior strains of this legume were selected.

Birdsfoot trefoil, while little used in American agriculture, appears to show enough desirable characteristics to warrant further investigation and im-

provement. The crop evidently cannot be expected to compete with alfalfa or red clover for hay production on the better soils and under a short-rotation system of farming, but it has distinct possibilities for hay and pasture on secondary, or poorer, soils where alfalfa does not succeed, where red clover is too short-lived for the rotation used, and summer conditions too droughty for persistence of white clover.

Birdsfoot trefoil may propagate by root cuttings, A. R. MIDGLEY and A. GERSHOY. (Vt. Expt. Sta.). (*Jour. Amer. Soc. Agron.*, 38 (1946), No. 2, pp. 197-199, *illus.* 3).—When plants of *Lotus corniculatus* were removed from the field and the tapering tap roots cut into segments 2 to 6 in. long, these crownless roots produced many new plants when planted. Rapid shoot proliferation from severed roots suggested that heaving on clay soils as well as occasional disking should thicken up established stands of birdsfoot trefoil.

The development of buffalo grass seed, J. R. HARLAN. (U. S. D. A.). (*Jour. Amer. Soc. Agron.*, 38 (1946), No. 2, pp. 135-141, *illus.* 2).—Details of the development of the seed of buffalo grass (*Buchloe dactyloides*) from the unfertilized ovary to maturity are described. The striking feature is the green scutellum which forms a broad shield behind the remainder of the embryo and on maturity covers the entire dorsal surface of the endosperm. A similar scutellum development is reported for the genus *Bouteloua*.

The relation of corn yields to nutrient balance as revealed by leaf analysis, E. H. TYNER and J. R. WEBB. (W. Va. Expt. Sta.). (*Jour. Amer. Soc. Agron.*, 38 (1946), No. 2, pp. 173-185).—An investigation with corn grown under field conditions dealt with N, P, and K interactions and balances occurring within the leaf tissue and their significance in determining efficiency of utilization of applied fertilizers as reflected by grain and stover yields. N and K exerted reciprocal influences. N fertilizers markedly depressed the percentage of K found in the leaves. At high rates of N application, the depression was large enough to induce an incipient K deficiency, which was reflected by a reduction in efficiency of N utilization. K had a slight depressive effect on the percentage of N, but this did not appear to affect yields significantly. P had no effect on either N or K contents; nor did N or K appear to affect P content. A suggestion was that NK balances might assume critical importance under field conditions on soils of low to moderate K or N supplying power.

Maize in Mexico.—A preliminary survey, E. ANDERSON (*Ann. Missouri. Bot. Gard.*, 33 (1946), No. 2, pp. 147-247, *about 100 illus.*).—Mexican corn, as described, varies from plant to plant in the same field and among fields in the same locality, as in the United States. These variations are greater in magnitude, and the regional variation is beyond anything encountered in the United States. The customary groupings of dent corns, popcorns, flint corns, etc., are considered to be misleading in Mexico. A method of measuring and describing corn populations (fields) developed is applied to the Mexican collections in analysis of the association and geographical distribution of high row number with narrow, pointed kernels. Other characters are shown to be associated with these trends in row number and shape of kernels. High row number, pointed kernels, wide, hairy leaves, condensed tassels, constitute a complex characterizing the Mexican Pyramidal race, centered in the State of Mexico. Low row number, long, irregularly tapering ears, wide kernels, narrow leaves, long, wiry tassel branches, form a complex characterizing the Mexican Narrow Ear race of western Mexico. A third race, Mountain Yellow, which resembles Guatemalan corn, is restricted to high altitudes, and from Jalisco eastward to Toluca becomes increasingly mixed with Mexican

Pyramidal. Corns grown for special purposes include varieties with colored aleurone, used as green corn, which apparently spread from western Mexico in ancient times and have become more or less mixed with the common varieties of each region; a large-kernelled flour corn known as "Cacahuazintle" apparently derived from the "Salpor" variety of Guatemala; maiz dulce, whose significance in the history of American sweet corns is briefly indicated; the ancient popcorn of the west coast, maiz reventador (E. S. R., 92, p. 503), and the different rice popcorns of the State of Mexico. Classification of the corn of Mexico, origin of denting in corn, and the genetics of multiple factor characters in North American corn are discussed in the light of the above survey.

Hybrid popcorn in Indiana, G. M. SMITH and A. M. BRUNSON. (Coop. U. S. D. A.). (*Indiana Sta. Bul.* 510 (1946), pp. 16+, illus. 9).—Cooperative breeding work (E. S. R., 93, p. 429) resulting in superior hybrid popcorns, performance trials, and popping expansion determinations are reported on, and recommendations are made on culture, storage, handling, and marketing the crop. The extent of the industry in Indiana is shown by counties. The several kernel types of Purdue popcorn hybrids and the parental inbreds are described.

Hybrids described have yielded from 9 to 72 percent more than the open-pollinated varieties with which they were compared, and were also superior in popping expansion and standing ability. Use of second generation hybrid seed is not recommended because of serious reductions in yield and uniformity. In general, the culture of popcorn is identical with that of dent corn. Pollination by dent corn or sweet corn does not materially affect the popping quality of that year's crop. Popcorn must mature on the plant completely and normally to be of good quality. Natural curing in narrow, well-ventilated cribs is deemed best. Where artificial drying is necessary, drying temperatures should be relatively low. Popcorn should not be shelled until it has dried to about 13.5 percent moisture content, optimum for best popping.

Fruiting and shedding of cotton in relation to light and other limiting factors, A. A. DUNLAP (*Texas Sta. Bul.* 677 (1945), pp. 104, illus. 23).—Research on effects of light, especially periods of low light intensity, together with related studies on other factors, as variations in water supply, high temperatures, N-P-K ratios, and varietal differences among upland cottons in sensitiveness to unfavorable light conditions, all in relation to fruiting and shedding in cotton, was conducted at the station 1939-45.

Cotton plants become well-fruited under conditions favoring production of a large number of blooms, little shedding, and moderate vegetative growth. Adequate sunlight is an important factor in these conditions, according to these studies. Variations in amount of light, such as accompany periods of cloudy weather, short days, and close spacing of plants, were found to result in impairment of fruiting and excessive vegetative growth. Heavy shedding of young bolls, often noted by growers after periods of rainy weather, appears probably due to the interruption in high sunlight intensity rather than to direct effects of rain on the flower. Modified light conditions and other factors that induce shedding were found to hinder photosynthesis and to reduce the carbohydrate content in cotton leaves. Differences in the sensitiveness of cotton varieties to unfavorable light conditions indicated the importance of careful selection of varieties for a given region, according to prevailing weather conditions during the fruiting season, and the need for attention to these inherent varietal differences by cotton breeders. Varieties

as Stoneville 2B, Coker 4-in-1, Deltapine 14, Half-and-Half, Roldo Rowden, and Washington, were found, in general, to be less sensitive to unfavorable variations in light conditions than such varieties as Qualla, A. D. Mebane Estate, Rogers Acala, and Lone Star.

Preliminary information on sweet lupines in the United States, R. MCKEE, H. L. HYLAND, and G. E. RITCHEY. (U. S. D. A., Fla. Expt. Sta., and La. Expt. Sta.). (*Jour. Amer. Soc. Agron.*, 38 (1946), No. 2, pp. 168-172).—Good growth and yields have been attained by nonalkaloid selections of yellow and blue species, but rather low yields by the white species, included in experimental plantings in the United States. Determination that varieties cross within species has made it necessary to keep isolated nonalkaloid selections from high-alkaloid plantings. Possible value of nonalkaloid lupines for livestock feed is suggested, and experiments to determine their feeding value are in progress at the Florida Experiment Station. A quick method for determining the presence of alkaloid is outlined.

Oat variety studies in Tennessee, N. I. HANCOCK and O. H. LONG (*Tennessee Sta. Bul.* 199 (1946), pp. 29, illus. 8).—Fall-sown oats are of considerably more value than spring-sown oats in Tennessee; selected winter-hardy varieties averaged 31 bu. per acre more than the best spring varieties. The fall-planted crop matures from 7 to 10 days earlier than spring-sown oats, and, as a rule, before rust infection damages seriously. Fall-sown oats also retard erosion during winter months when rainfall is heavy, and, when seeded early, provide very palatable winter pasture. Tennex, Fulwin, and Forkedeer, derived in Tennessee from Fulghum oats, are winter hardy and in all trials outyielded Winter Turf, once the standard variety. They are often sown after corn with satisfactory results. Lee, Letoria, Stanton, and Fulgrain belong in the semi-winter-hardy group, which do not retain dormant, prostrate seedling growth under variable climatic conditions. In Tennessee, such varieties are adapted only to restricted dates of seeding in the fall. Semi-winter-hardy varieties thus far introduced are not vigorous growers and are better adapted to high levels of fertility than to low levels. Of this group, Fulgrain stands up best. Since low levels of fertility of oats land predominate in Tennessee, vigorous oats such as Tennex, Fulwin, and Forkedeer are required. On medium to high levels of fertility, these 3 varieties have wide spread of seeding dates, Forkedeer standing up best. All three Tennessee varieties mature earlier than Winter Turf and Lee. Fulgrain and the Tennessee selection of 090 × Bond 140-17-63-75 are the earliest maturing of all oat varieties tested so far, but sometimes they are damaged by late spring freezes. For spring sowing, oat varieties having the spring erect type of seeding growth are considered better than the winter varieties.

Fertilizer studies with potatoes, O. SMITH and W. C. KELLY. (Cornell Univ.). (*Amer. Potato Jour.*, 23 (1946), No. 4, pp. 107-135, illus. 10).—Effects of two rates of fertilizer application, three methods of fertilizer placement, three combinations of K sources, and two of N sources on the content of the petioles of the plants of N, P, K, Ca, and Mg, at various times during the growing season, total yield and yield of U. S. No. 1 size tubers, and specific gravity of the tubers of the Green Mountain variety were studied in 1944 on Lordstown silt loam.

Yields of U. S. No. 1 size potatoes resulting from 2,400 lb. per acre applications of 5-10-10 fertilizer averaged 52 bu. per acre more than with 1,200-lb. applications. K source and fertilizer placement method greatly influenced yields obtained from any one rate. Yields were influenced markedly by method of fertilizer placement, that of one-half broadcast, then plowed, one-half in

equal bands at planting time resulting in highest yields. Increases in yields of this method above that of all in bands at planting ranged from 25 to 66 bu. per acre, depending upon rate of application and N and K sources. Yields were influenced further by the K source, that of one-half KCl, one-half sulfate of potash-magnesia, consistently outyielding the other two sources.

The correlation of N content of petioles at each date of sampling with yields was highly significant, additional N being a major single factor causing increased yields of potatoes from 2,400-lb. v. the 1,200-lb. acre rate. Placement of all fertilizer in bands at planting was not so efficient for N uptake by the plant as when part of the fertilizer was broadcasted before plowing or applied on the plow sole. No significant difference appeared in the P content of leaf petioles at any sampling date between any factors studied. Petioles of all treatments contained large quantities of K; evidently enough K was taken up from all treatments to result in high yields.

Correlation of the Mg content of petioles with yields was highly significant. In every case where sulfate of potash-magnesia was in the fertilizer, the Mg content in petioles was highest and yields were also the largest. The increased yields were evidently due to the Mg and not to the sulfate form of potash in the sulfate of potash-magnesia. The amount of Mg in the 1,200 lb. per acre application with 50 percent of the K as sulfate of potash-magnesia (50.5 lb. MgO per acre) sufficed for optimum Mg absorption by the plant and for maximum potato yields under the conditions.

In general, all treatments tending to increase yields tended to decrease the specific gravity of the tubers of those treatments. The specific gravity of tubers grown with one-half the K from KCl and one-half from K_2SO_4 exceeded that of tubers grown with KCl as the sole K source. Plants in plots receiving all of the K as KCl matured and died earlier than did those containing part of the K as sulfate of potash-magnesia, and plants receiving all fertilizer in bands at planting matured and died earlier than those receiving part of fertilizer broadcasted before plowing or applied on the plow sole.

The residual effect of crop rotations on potato yield and the presence of potato scab. E. J. WHEELER (*Michigan Sta. Quart. Bul.*, 28 (1946), No. 4, pp. 326-332, illus. 1).—Katahdin potatoes grown at Lake City 1935-44 averaged 154 bu. of U. S. No. 1 tubers per acre in the 4-yr. rotation alfalfa (3 yr.), potatoes; 127 bu. in the 3-yr. sweetclover (2 yr.), potatoes rotation; 97 bu. on the 2-yr. corn (rye seeded at last cultivation), potatoes; and 103 bu. from continuous potatoes. The respective average percentages of scab-free potatoes were 84, 43, 87, and 70 percent. Decline in percentage of clean potatoes from 1935 to 1944 was greatest on sweetclover plots, followed by the check, alfalfa, and rye plots. The merits of a cultural practice recommended to take advantage of the high percentage of scab-free U. S. No. 1 size potatoes on the rye rotation with the higher yields produced on the alfalfa rotation plots were demonstrated.

Storage conditions which affect the vitamin C content of Maine-grown potatoes. E. MURPHY. (Maine Expt. Sta.). (*Amer. Potato Jour.*, 23 (1946), No. 6, pp. 197-218, illus. 3).—Recently dug Irish Cobbler, Mohawk, Green Mountain, Chippewa, Katahdin and Sebago potatoes were held at 32°, 36°, 50°, 60°, or 65°, and 70° F. for 7 mo. in 1943-44 and 1944-45 seasons, and were analyzed monthly for vitamin C.

Mohawk showed the highest average value and Chippewa the lowest. An average decrease from 22.7 to 6.3 mg. per 100 gm. took place during the 7 mo., one-third to one-half of the total loss occurring during the first month. The higher temperatures were conducive to larger retention of vitamin C

than were 32° and 36°, although neither 60°, 65°, nor 70° was superior to 50°. Varieties appear to differ in response to temperature and duration of storage. During both years Mohawk remained at a relatively high level and Chippewa at a low one throughout the period. Sebago decreased at a disproportionately rapid rate, whereas Green Mountain tended to improve its position. Although varietal differences diminished greatly under influence of storage, they were not nullified completely. New tubers averaged 10.9 mg. higher in 1944 than in 1943, but after 7 months' storage, the average difference was only 2.3 mg. per 100 gm. Only 36° and 50° maintained tubers of good physical quality. If vitamin C retention is a criterion of quality, 50° would be considered superior to all others tested. References total 29.

Fertilizing soybeans: Lime, potash, and phosphate are needed, W. L. NELSON (*Res. and Farming* [North Carolina Sta.], 4 (1946), *Prog. Rpt. 3*, pp. 4-5, 9, *illus. 3*).—Fertilizer tests on several soil types indicated that acre yields of 25 to 40 bu. may be expected if needs of the soil for lime, K, and P are supplied. The treatments would vary according to the preceding crop in the rotation.

Tobacco Substation at Windsor, report for 1945, P. J. ANDERSON, T. R. SWANBACK, ET AL. (*Connecticut* [New Haven] *Sta. Bul. 493* (1946), pp. 31, *illus. 3*).—In addition to continued investigations with cigar-leaf tobacco (E. S. R., 94, p. 616) noted below, preservation of shade tent poles is noted on p. 669, influence of cover crops on wireworm injury on p. 691, and incidence of diseases in 1945 and control of *Sclerotinia* pole rot, wildfire in the Connecticut Valley, and chloropicrin for sterilization of seedbeds on p. 670. Tables show the acreage and production of Broadleaf, Havana Seed, and shade-grown tobacco in the Connecticut Valley for the years 1942-45 and average for 1932-41, and tobacco stocks on hand and cigar consumption 1933-45.

Boron in tobacco fertilization, T. R. Swanback (pp. 5-8).—Where tobacco yields averaged more than 1 ton per acre, yields were not affected by 10 or 20 lb. per acre of borax applied on each side of the row or by 15 or 20 lb. broadcasted. The grading, however, was usually improved where borax was applied, although statistical differences were obtained only when more than 10 lb. per acre was used. In the experiments, the soil was enriched from about 0.5 to a little more than 1 p. p. m. Since 15 lb. of borax broadcasted (together with regular fertilizer), furnishing about 1 p. p. m. of B, produced optimum response, this amount could be applied safely when there is an apparent B need. The author emphasized that this is a one-time application, not to be repeated without a soil test for B content. A continuous use of not more than 5 lb. of borax per ton of fertilizer evidently would be a safe procedure.

Connecticut fifteen, a root rot-resistant type of shade tobacco, P. J. Anderson and A. Green (pp. 27-28).—Connecticut 15, a new variety of shade tobacco which shows marked resistance to black root rot, surpasses ordinary shade strains in many other respects. It is very uniform in all of its characteristics, the plants are taller than common shade, producing 20 to 25 marketable leaves as compared to 15 to 18 for ordinary tobacco, and the variety tops out later and is not so inclined to branch into long suckers at the top. The leaves are rounder, more of desirable shape persisting to the uppermost leaf, whereas the leaves in the common type become pointed as they approach the top of the plant. Cured leaves of Connecticut 15 are of a lighter shade and more uniform color, less inclined to exhibit yellow spots, tips, and margins, and the vein is less prominent than in the common type. This means that a larger percentage of the leaves are sorted into the

higher priced grades. Connecticut 15 showed an increase of 34 percent in value per pound over other shade strains in the last 2 yr. Tobacco men growing the new variety report increases in acre yield of marketable leaves ranging from 25 to 50 percent.

Leaf-burn of tobacco as influenced by content of potassium, nitrogen, and chlorine. O. J. ATTOE. (Wis. Expt. Sta.). (*Jour. Amer. Soc. Agron.*, 38 (1946), No. 2, pp. 186-196, illus. 4).—Nearly all of the variations in the leaf-burn of tobacco collected from farmers' fields in Wisconsin 1939-41 were found to be related to the contents of K_2O , reduced N (organic and ammonium forms), and Cl. The equation given for the relationship was: $\text{Log burn in seconds} = -0.009 + 0.583A + 0.473A^2$, where $A = 0.913 + 0.295 \times \% K_2O - 0.431 \times \% N - 0.354 \times \% Cl$. On the basis of the value of their coefficients in this equation, reduced N is 1.46 times more detrimental to leaf-burn than K_2O is beneficial, and 1.22 times more detrimental than Cl. The coefficient of correlation is 0.921. Amount of exchangeable K_2O in the soil on which the tobacco was grown greatly influenced the K_2O content of the leaves and consequently their leaf-burn values. This relationship, for average contents of reduced N and Cl in the leaf, was expressed by the equation: $\text{Log burn in seconds} = 3.153 - 3.328B + 0.829B^2$, where $B = \text{log lbs. exchangeable } K_2O \text{ per acre}$. According to this equation, there results a leafburn of about 1 sec. for 200 lb. of exchangeable K_2O per acre, 2 sec. for 600 lb., 4 sec. for 950 lb., 8 sec. for 1,400 lb., 16 sec. for 2,000 lb., and 32 sec. for 2,750 lb.

Winter wheat varieties for Oklahoma. A. M. SCHLEHUBER, V. C. HUBBARD, W. M. OSBORN, C. B. CROSS, and R. M. OSWALT. (Coop. U. S. D. A.) (*Oklahoma Sta. Bul.*, 297 (1946), pp. 36, illus. 2).—Cheyenne, Comanche, Pawnee, Tenmarq, and Turkey hard red winter wheat and Clarkan and Fulcaster soft red winter wheat are recommended for Oklahoma on the basis of yields in variety tests at Stillwater, Lawton, and Woodward 1931-45 and in county tests, and milling and baking experiments. Varieties tested are described. Tables show acreage occupied by each important variety and annual and average yields of varieties at each station.

The value of winter wheat for pasture was determined by clipping. At Stillwater, clipping to March 25 produced about 3,000 lb. of green forage per acre, and reduced grain yield about 3 bu. Clipping to April 1 doubled forage production, but the grain yield was only about 5 bu. At Woodward no reduction in grain yield occurred with clipping to March 25, and only slight reduction when clipped to April 1. Clipping after April 1, however, resulted in substantial decreases in grain yield. About 1,700 lb. of green forage was produced when clipped to March 15 and about 3,000 lb. to April 1. Marked varietal differences in grain reduction after clipping or in production of green forage were not apparent at either station.

Structure, properties, and preparation of certain bast fibers. H. B. HANSON (*Iowa State Col. Jour. Sci.*, 20 (1946), No. 3, pp. 365-383, illus. 10).—The relative quantity, properties, and extractability of the fiber were studied in *Apocynum cannabinum* (Indian hemp or dogbane), *Cannabis sativa* (hemp), *Asclepias syriaca* (common milkweed), *A. sullivantii* (smooth-leaved milkweed), and *Gonolobus laevis* (climbing milkweed). The quantity of fiber in the stems of these plants justified further study of means of economical commercial production, extraction, and utilization. Their fiber cells were found to have the necessary cell dimensions and to be similar enough to flax fiber to be spun and woven into fabric. Reactions of their fibers to reagents used in care of fabrics were similar to the reactions of flax. The luster and high

quality of the fiber in *Gonolobus* merits study of the cultivation, processing, and utilization of this species. *A. verticillata* (whorled milkweed), also tested, was considered of no value as a source of fiber.

Production and distribution of foundation seed stocks, G. L. STOKER (*Farm and Home Sci. [Utah Sta.]*, 7 (1946), No. 2, p. 20, illus. 1).—Foundation seed stocks produced by the Utah Station and released through the Utah Crop Improvement Association include Velvon 11, Trebi, and Winter Club barley; Uton and a new short oats not yet named; Dicklow, Early Baart, Federation and Lemhi spring wheats; Cache and Wasatch winter wheats; Bliss potatoes; and White Sweet Spanish and Yellow Sweet Spanish onions. The association also distributes seed of alfalfa and red clover from other stations.

Four weed threats, A. H. HOLMGREN (*Farm and Home Sci. [Utah Sta.]*, 7 (1946), No. 2, pp. 13–14, illus. 4).—Austrian fieldcress (*Roripa austriaca*), camelthorn (*Alhagi camelorum*), St. Johnswort (*Hypericum perforatum*), and yellow star-thistle (*Centaurea solstitialis*), described and illustrated, have been declared noxious by the Utah Board of Agriculture, although they are not yet known to occur in the State. Since their introduction into the United States all four weeds have spread rapidly and are now known in areas close enough to Utah to cause concern.

Some effects of 2,4-D on ragweed and certain woody plants, B. H. GRIGSBY (*Michigan Sta. Quart. Bul.*, 28 (1946), No. 4, pp. 304–310, illus. 1).—Further experiments (E. S. R., 94, p. 468) showed that ragweed can be killed by a single application of 2,4-D at a concentration of 1,000 p. p. m. Pollen production by old plants can be stopped, without causing immediate death of the plants, by spraying with a concentration of 500 p. p. m. Faster response may be obtained by addition of very small amounts of sodium chlorate or Ammate. Pollen formation may also be prevented by spraying ragweed in the stage of growth just preceding flower-stalk elongation with 250 p. p. m. Plants sprayed in this stage appear to be arrested in development but usually persist until frost, but they produce few seeds. Young growth of poison-ivy is usually killed by 100 p. p. m. of 2,4-D, but older growth may be somewhat resistant. The 2,4-D seems to have slight effect upon mature growth of many woody plants.

A tropical-weed killer, D. G. WHITE and A. G. VILLAFANE. (Puerto Rico Federal Expt. Sta.). (*U. S. Dept. Agr., Agr. in Americas*, 6 (1946), No. 8, pp. 126–128, illus. 3).—Weeds killed with a commercial mixture of 2,4-D included nutgrass (*Cyperus rotundus*), dayflower (*Commelina longicaulis*), caladium (*Caladium* sp.), water-hyacinth (*Eichhornia crassipes*), royal waterlily (*Victoria regia*), and lotus lilies (*Nymphaea* spp.).

HORTICULTURE

Advantages and limitations of glass plant protectors in the production of certain vegetables, E. P. BRASHER (*Delaware Sta. Cir.* 18 (1945), pp. 11, illus. 1).—Rejected Pyrex baking dishes placed over hills of sweet corn, tomato, cantaloup, watermelon, and pole lima beans hastened decidedly the germination of all the crops. In the case of the lima beans no germination was obtained in the open, with a perfect stand under the protectors. Soil and air temperatures were higher under the covers, with a difference of 2° to 5° F. registered in the soil at a depth of 4 in.

Early yields were increased with all crops except the watermelons, which were damaged by damping-off fungi. With the cantaloup and tomato the

early advantage in yield persisted so that total yields were significantly higher. However, on an economic basis, the cantaloup was the only crop which would have paid for the added cost.

For the home garden the plant protectors would have a material benefit, provided protectors could be purchased for less than 10 cents. In the home garden it would be more feasible to ventilate the protectors so as to avoid overheating and damping-off troubles.

Further studies on the response of lettuce to fertilization, A. E. GRIFFITHS and A. H. FINCH (*Arizona Sta. Bul.* 199 (1945), pp. 42+, illus. 4).—Band placement of fertilizers in which the material was distributed at time of planting in a band approximately 1 in. wide, 3 in. below the seed, and 1.5 in. to the furrow side resulted in larger heads and greater yields than did the same amounts broadcasted. On soils of good fertility and organic matter content simple chemical fertilizers were efficient. On such soils a fertilizer program of phosphates applied at planting time and nitrogen applied later as a side dressing gave the best results. On such soils band-placed N at time of planting sometimes delayed maturity and made for slimed, soft heads. This was especially true in autumn when high temperatures prevailed. On the other hand, band-placed N with the P at time of planting was generally beneficial for crops growing in the cool winter months and for crops on soil of low fertility. On soil lacking in organic matter the band placement of mixtures containing blood meal or goat manure resulted in better lettuce crops than did chemicals alone.

The general need of phosphate applied at time of planting was again demonstrated, and all sources of phosphorus were equally effective when applied in equal amounts of actual phosphorus. About 70 lb. of band-placed P_2O_5 per acre gave the best results generally. The vigorous growth of lettuce during its early stages was apparently important to the success of the crop.

Organic matter was shown to be of great significance. On a heavy soil depleted of organic matter, 10 tons of corral manure gave results better than were obtained with any chemical fertilizer. Legume green manures were helpful in maintaining organic matter. The absorption of both N and P by the lettuce plant was increased in the presence of abundant organic matter.

Changes in the Blue Hubbard squash skin during storage and its relation to squash spoilage, M. C. RICHARDS, A. F. YEAGER, and R. C. JONES (*N. H. Hort. Soc. Jour.*, 9 (1946), pp. 51–56, illus. 2).—In 1944, beginning 2 weeks before harvest and continuing periodically into the storage season, sections of the surface tissues were collected from thick- and thin-skinned types of Blue Hubbard squash. In cross section, the skin was found to be composed of a thick layer of cuticle, a distinct epidermal layer, and then a section about 20–25 cells thick of round, thin-walled parenchyma cells. Below this there was a layer of round to elongate parenchyma cells which develop pits and thickened cell walls during storage. Lignification occurs in the cell walls during storage. The process is gradual and much more evident in the thick- than thin-skinned types. Lignification was not an important factor in preventing storage rots, but a prestorage treatment of 14 days in a warm greenhouse was worth while in decreasing subsequent spoilage during storage.

New strawberry looks good, E. B. MORROW. (Coop. U. S. D. A.). (*Res. and Farming* [North Carolina Sta.], 4 (1946), *Prog. Rpt.* 3, p. 2, illus. 2).—In a test of 15 strawberry varieties at the McCullers Branch Station, Midland, a new variety released recently by the U. S. Department of Agriculture, outyielded all other varieties, producing at the rate of 278 crates per acre as compared with 191 crates for Blakemore and Massey. However, in trials at

the Coastal Plain Branch Station Midland was surpassed in yield by other varieties including Fairfax and NC 1039. In both the 1945 and 1946 season NC 1039 has outyielded both Blakemore and Massey at the Coastal Plain Station and appears to have much promise. At the Coastal Plain Station seven kinds equaled but did not surpass Massey in size. Of the named varieties Blakemore and Massey appear best for the Coastal Plain region.

Effect of oxygen concentration on respiration of the Fuerte avocado fruit, J. B. BIALE. (Univ. Calif.). (*Amer. Jour. Bot.*, 33' (1946), No. 5, pp. 363-373, illus. 10).—Certain relationships were observed between the effects of oxygen and temperature on the respiration rates of Fuerte avocado fruits taken from 6- to 7-year-old trees on the Los Angeles campus of the University of California. At low temperatures the effects of O_2 concentrations are minimized, with the consequence that the temperature coefficient (Q_{10}) was markedly different for the several O_2 levels. Thus at 2.5 percent O_2 , the Q_{10} for the minimum respiratory rates in the range of 5° to 15° C. had a value of two, while the corresponding Q_{10} magnitude in air was two and one-half times as high. At 2.5 percent O_2 it took approximately twice as long for the fruit to soften as in air. The total amount of CO_2 given off by the fruit during the period ending with the climacteric peak was found to be approximately constant for the several modified atmospheres at 15°.

The effects of O_2 tension on respiration were markedly modified by temperature. Fruit softening was found to be closely related to the respiration trends.

Physiology of citrus fruits in storage, E. V. MILLER. (U. S. D. A.). (*Bot. Rev.*, 12 (1946), No. 7, pp. 393-423).—This critical review (75 references) discusses the changes taking place during ripening, after harvest, and in cold storage, respiration, physiological disorders occurring during storage and their development over that period, factors influencing the incidence of low temperature injuries, methods for preventing low-temperature break-down, CO_2 storage, and ethylene treatment. "If a concise recommendation for storing citrus fruits is desired, it can be expressed as follows: Eliminate insofar as practicable the prestorage conditions that have been described in this paper as undesirable. Select the temperature recommended for the particular type of fruit and attempt to maintain optimum conditions in storage. If the loss of moisture is being retarded by the use of moisture-proof wrappers, inclusion of a suitable disinfectant in the wrapper is highly desirable. Make periodic inspections of the stored fruit in order to terminate the storage at the very first symptoms of development of physiological disorders."

Saving Puerto Rican coffee soil, E. A. TELFORD (*U. S. Dept. Agr., Agr. in Americas*, 6 (1946), No. 8, pp. 118-121, illus. 4).—The history of coffee production in Puerto Rico is presented, together with information as to present status, the role that the Soil Conservation Service is playing in developing plantations on steep hillsides, and data on the yields on well-managed plantations obtained by the University of Puerto Rico. Results on run-off plots in Mayaguez indicate that areas in coffee which are protected by terraces, crop residues, and good ground cover lose less soil and moisture than do similarly located plots of sugarcane, Bermuda grass, or clean-tilled crops.

Tea in place of gold, K. WERNIMONT (*U. S. Dept. Agr., Agr. in Americas*, 6 (1946), No. 8, pp. 115-117, illus. 2).—With a total of some 4 million bushes, yielding an estimated 175,000 lb. of processed black tea, tea production has attained a position of great importance in the State of Minas Geraes, Brazil, and adjoining areas. This article discusses the terrain, methods of culture, harvesting, processing, and handling of the product.

The jack fruit (*Artocarpus integra*, Merrill), its planting in Coconut Grove, Florida, D. FAIRCHILD (*Fairchild Trop. Garden, Occas. Paper No. 16 (1946)*, pp. 14, illus. 8).

Grass oil from Guatemala, G. S. QUATE (*U. S. Dept. Agr., Agr. in Americas, 6 (1946)*, No. 8, pp. 122-125, illus. 7).—The production of volatile oils from highly scented grasses has become an important industry in Guatemala. This article discusses the production of citronella and lemon grass, with notes on development of the industry, harvesting and planting, processing, and general problems.

FORESTRY

A Spanish-English glossary of forestry terminology, I. C. GARCIA-PIQUERA (*U. S. Dept. Agr., Forest Serv., Caribbean Forester, 7 (1946)*, No. 2, pp. 103-120).—About 100 terms are here defined, with a partial bibliography of sources.

Good forest management to meet timber requirements of post-war era and future, M. PAYNE (*Miss. Farm Res. [Mississippi Sta.], 9 (1946)*, No. 2, pp. 1, 5, illus. 1).—A discussion is presented of the timber supplies in the United States as a whole and in Mississippi in particular where, during the war years, the annual cut has been greater than the annual growth. The author outlines better management and cutting practices which would maintain Mississippi forest lands in a permanently productive status and at the same time insure the timber owner a maximum return.

Specifications for aerial photographs used in forest management, S. H. SPURR and C. T. BROWN, JR. (*Photogrammetric Engin., 12 (1946)*, No. 2, pp. 131-141, illus. 2).

A sectional pole for measuring tree heights, F. G. LIMING. (U. S. D. A.). (*Jour. Forestry, 44 (1946)*, No. 7, pp. 512-514, illus. 1).—A description is presented of a measuring pole designed to meet the need for a convenient instrument for making periodic height measurements of young trees.

Effect of chemical treatments on the germination of forest tree seeds, L. P. V. JOHNSON (*Forestry Chron., 22 (1946)*, No. 1, pp. 17-24).—A number of chemicals were tested in comparison with stratification and presoaking for their effects on germination of forest tree seeds. The most striking acceleration was obtained from potassium nitrate treatments applied to seeds of *Picea glauca* and *P. rubens*. Significant increases in percentage germination were obtained from potassium nitrate in *Betula lenta*, *B. papyrifera*, *Fraxinus excelsior*, *P. abies*, *P. glauca*, *P. rubens*, and *Pinus resinosa*; from thiourea in *Larix decidua*, *Picea abies*, *P. glauca*, and *P. rubens*; from ethylene chlorhydrin in *Betula lenta*, *B. papyrifera*, *Fraxinus excelsior*, *Larix decidua*, and *Pinus resinosa*; from red copper oxide in *Pinus resinosa*; and from zinc oxide in *Betula papyrifera*, *Picea glauca*, *Pinus banksiana*, and *P. resinosa*.

In general stratification proved more effective than the chemical treatments, but it is pointed out that much is yet to be learned about the proper use of chemicals whereas stratification has many years of background.

In a few instances the simple soaking of seeds in water for a 24-hr. period gave good results. There was some evidence in some instances that a part of the beneficial effects of chemicals could be traced to their protective influence against damping-off organisms.

Seasonal progress of rooting of Norway spruce cuttings, N. H. GRACE and J. L. FARRAR (*Jour. Forestry, 44 (1946)*, No. 5, p. 376).—Observations at Pembroke, Ontario, on the development of dormant cuttings taken from the

lower part of 20-year-old trees and set in outdoor frames in November 1940 showed that 25 percent had callused by the end of the following June and by mid-July 80 percent had rooted. The percentage of rooting reached a final value of 95 percent in early September. By September 23, root growth had ceased. The buds developed into new shoots on less than one-half of the cuttings.

Ecological changes due to thinning red pine, K.-H. CHEO. (Univ. of Minn.). (*Jour. Forestry*, 44 (1946), No. 5, pp. 369-371).—During the growing season of 1936 and 1937 a comprehensive study of environmental factors was conducted in four thinning plots established in 1927 in a 15-year-old red pine stand at the Cloquet Forest Experiment Station (Minnesota). Growth measurements indicated that the best growth for the selected crop trees occurred in the 6 x 6 ft. spacing. At this distance trees could be permitted to grow for at least 25 yr. without further thinning. The 7 x 7 ft. spacing was second, the 4 x 4 third, and the 9 x 9 least desirable. Measurements at weekly intervals with a photometer at 12 points in each plot showed respective averages of 15.4, 16.5, 36.1, and 60.2 percent of full sunlight in the 4 x 4, 6 x 6, 7 x 7, and 9 x 9 ft. spacings.

Ponderosa pine in the second cutting cycle, G. A. PEARSON. (U. S. D. A.) (*Jour. Forestry*, 44 (1946), No. 5, pp. 354-368, illus. 9).—A 480-acre sample plot in the Fort Valley Experimental Forest, Arizona, logged in 1909 and again in 1939 was remeasured in 1944 for the first 5-yr. record in the second cycle. Net annual increment per acre declined from a high of 115 bd. ft. per acre in the second 5-yr. period (1914-19) to 52 ft. in the sixth period (1934-39). According to the 20-yr. trend before cutting, the net annual increment would have declined further to about 40 bd. ft. in 1944 but rose instead to 67 ft. notwithstanding a reduction in the volume of growing stock by 50 percent. Analyses of trends before and after the second cutting indicate that if the second cut had been made 10 yr. earlier the net increment today would be at least 50 percent higher than it is. Comparison of three methods of cutting indicates that marking should be governed by silvicultural principles applied to each tree rather than a blanket system. Good dominants should not be sacrificed in favor of poor subordinates. Enough relatively large trees should be left to provide for the next cut.

Pruning forest trees by the finger-budding method, J. D. CURTIS. (Univ. Maine). (*Jour. Forestry*, 44 (1946), No. 6, pp. 502-504).—Removal of lateral buds near the terminal shoot with a view to obtaining knot-free lumber was tested under Maine conditions. Certain preliminary conclusions were reached, for example, that species whose terminal bud is subject to insect or other injury are not adapted to hand disbudding and that damage as leaders from climatic agencies may be expected in exposed locations. There is indicated a need of further observations.

Tree pruning by annual removal of lateral buds, B. H. PAUL. (U. S. D. A.). (*Jour. Forestry*, 44 (1946), No. 7, pp. 499-501, illus. 1).—Tests conducted in the Nicolet National Forest in Wisconsin indicated certain advantages and disadvantages in the pruning of red pine, *Pinus resinosa*, by the annual removal of the lateral buds that cluster about the terminal bud. The first few sets of laterals were allowed to grow in order to nourish the young tree during the years of treatment.

A modified treatment is suggested in which the lateral buds are permitted to make 1 year's growth before removal.

Susceptibility of beech to drought and adverse winter conditions, P. SPAULDING. (U. S. D. A.). (*Jour. Forestry*, 44 (1946), No. 5, p. 377).—The author,

reports the occurrence of winter injury to beech and other hardwoods in the Adirondack and nearby Lake State areas in 1934 and in Vermont and Maine in 1943. Both incidents were noted in periods when summer droughts were followed by winters of adversity.

The lignin, ash, and protein content of some neotropical woods, F. J. MARCHAN. (P. R. Univ. Expt. Sta.). (*U. S. Dept. Agr., Forest Serv., Caribbean Forester*, 7 (1946), No. 2, pp. 135-138, 150; *Span. abs.*, p. 150).—Analyses by the Waksman-Stevens method for lignin in soils (E. S. R., 59, p. 717) are tabulated for about 40 species of neotropical and other woods, together with data on their ash and protein contents and resistance to termite attack.

The physical-mechanical properties of certain West Indian timbers, I, R. W. WELLWOOD (*U. S. Dept. Agr., Forest Serv., Caribbean Forester*, 7 (1946), No. 2, pp. 151-189, *illus.* 9; *Span. abs.* pp. 174-189, *Fr. abs.* p. 189).—This paper deals with the properties of tabonuco (*Dacryodes excelsa* Vahl), a native of the montane forests of Puerto Rico, and the most important timber tree of that Island. Tabonuco wood has interlocked grain and a ribbon-type figure. Seasoned heartwood, which has a lustrous brown color, planes and finishes well. At present it is used locally for furniture, carpentry, and construction. Although it is not highly regarded as a first-class timber, its superior strength properties and attractive appearance merit wider use in cabinetry, furniture, and interior trim and it should produce attractive veneers.

A convenient method for cold-soaking fence posts in a pentachlorophenol solution, R. W. LORENZ. (Univ. Ill.). (*Jour. Forestry*, 44 (1946), No. 7, pp. 520-522, *illus.* 1).—Specifications and cost data are presented for a simple plant for treating fence posts by the cold-soaking method using pentachlorophenol dissolved in fuel oil.

Preservation of shade tent poles, H. W. HICOCK and P. J. ANDERSON (*Connecticut [New Haven] Sta. Bul.* 493 (1946), pp. 8-14, *illus.* 1).—With the passing of the chestnut, several other species, including white cedar, red cedar, black locust, and oak, were tried as post material with rather unsatisfactory results. Tests were made of various preservatives and methods of treatment that might prolong the life of posts. Superficial treatments by brushing, dipping, or spraying did not penetrate the wood and are reported as of little value in preservation.

Treatment of the butts in hot and cool creosote prolonged life to 15 yr. as compared with 5 yr. for untreated. Pressure treatments, tried with various chemicals, gave promising results. Freshly cut posts were treated by the sap-stream method with copper sulfate, sodium fluoride, and zinc chloride. In this process the sap is replaced under gravity or head pressure by a chemical solution. After 6 yr. the zinc chloride-treated posts showed no deterioration.

A method of measuring checks in veneer, J. P. LIMBACH. (U. S. D. A.). (*Jour. Forestry*, 44 (1946), No. 7, pp. 509-511, *illus.* 3).—This article describes a method of measuring the depth and length of checks in veneer and of determining the number per unit of area.

DISEASES OF PLANTS

The recruitment and training of plant pathologists in Great Britain: A report prepared by the Plant Pests and Diseases Committee and adopted by the Council of the Association of Applied Biologists (*Ann. Appl. Biol.*, 33 (1946), No. 1, pp. 119-123).

[Plant disease work] (*Connecticut [New Haven] Sta. Bul.* 493 (1946), pp. 16-27, 29-31, illus. 2).—The following brief reports are included: Tobacco diseases in 1945 and studies on pole rot—IV, sclerotinia rot (E. S. R., 89, p. 457), both by P. J. Anderson; wildfire returns to the valley; and chloropicrin for sterilization of tobacco seed beds, by T. R. Swanback and Anderson.

Plantesygdomme i Danmark 1942 [and 1943]: Oversigt, samlet ved Statens plantepatologiske Forsøg (Plant diseases and pests in Denmark 1942 [and 1943] (*Tidsskr. Planteavl*, 48 (1943), No. 1, pp. 1-90, illus. 4, English abs. pp. 87-90; 49 (1944), No. 1, pp. 1-72, illus. 3, Eng. abs. pp. 63-72).—A summary of physiological, virus, fungus, and bacterial diseases and of insect pests of plants.

Index to Supplements 152-159, 1945 (U. S. Dept. Agr., *Plant Disease Rptr.*, 1946, Sup. 160, pp. 225-233+).

Present-day quarantine emergencies, C. J. DRAKE (*Amer. Nurseryman*, 83 (1946), No. 9, pp. 13-14, 45-46).—An address, as president of the Central Plant Board, at its meeting in St. Louis. March 25, 1946.

A contribution to the fungus flora of Utah and Nevada, A. S. RHODES (U. S. Dept. Agr., *Plant Disease Rptr.*, 1946, Sup. 162, pp. 67-99+).—The fungi listed comprise miscellaneous collections made during the latter part of 1944 and the first half of 1945; records from a few collections by others and turned over to the author for determination are also included by reason of their interest. Unless otherwise stated, the fungi included in this annotated list were collected in Utah and by the author. Specimens of these fungi have been deposited in the Mycological Collections of the Department and duplicates of most of them also with the Utah Experiment Station.

Notes on seed-borne fungi.—IV, *Acremonia*, *Chlamydomyces*, and *Trichocladium*, J. W. GROVES and A. J. SKOLKO (*Canad. Jour. Res.*, 24 (1946), No. 3, Sect. C, pp. 74-80, illus. 8).—In these notes (E. S. R., 93, p. 725), *A. atra*, *A. verrucosa*, *C. palmarum* and *T. asperum*—isolated from agricultural seeds—are described and illustrated; these fungi did not appear to be significant pathologically.

Synchytrium decipiens and *Synchytrium chrysosplenii*, M. T. COOK. (La. State Univ.) (*Mycologia*, 38 (1946), No. 3, pp. 300-305, illus. 3).—The author describes and illustrates the histopathology of *S. decipiens* on leaves, petioles, and stems of *Amphicarpa monoica* and of *S. chrysosplenii* on leaves of *Chrysosplenium americanum*.

Isolation of *Thielaviopsis basicola* from soil by means of [living] carrot disks, C. E. YARWOOD. (Univ. Calif.). (*Mycologia*, 38 (1946), No. 3, pp. 346-348).

Copper 8-quinolinolate, a promising fungicide, D. POWELL. (Univ. Ill.). (*Phytopathology*, 36 (1946), No. 7, pp. 572-573).—Preliminary laboratory tests with derivatives of 8-quinolinol against *Sclerotinia fructicola* gave promise of the fungicidal efficiency of copper 8-quinolinolate. In subsequent preliminary field tests on 30-year-old Duchess apple trees this compound compared favorably with Fermate and Puratized N5-E against apple scab and blotch; commercial control was not secured with Isothan Q 15 or Q 32. Fruit maturation appeared to be directly correlated with the degree of fungus infection rather than with the chemical treatment used. No visible chemical injury to fruit or foliage resulted under the conditions of this test.

The cereals root eelworm *Heterodera major* (O. Schmidt) Franklin in North Wales, I. THOMAS, E. B. BROWN, and R. J. WILLIS (*Ann. Appl. Biol.*, 36 (1946), No. 1, pp. 63-65, illus. 3).—*H. major* is shown to be locally distributed in North Wales, the most heavily infested areas being in the arable

districts of the eastern counties. The most severe attacks were on oats, where the crop had been grown too frequently; wheat and barley appeared to be unaffected at the cyst populations encountered.

Eyespot of wheat and barley in Scotland in 1944, M. D. GLYNNE (*Ann. Appl. Biol.*, **33** (1946), No. 1, pp. 35-39).—In August 1944, *Cercospora herpotrichoides* infection was found in 90 of 121 fall-sown wheat crops distributed over 12 Scottish counties, was abundant enough in 40 fields probably to harm later crops, and was causing obvious loss in 11 crops. The disease was also found in 17 of 18 spring-sown barley crops. Eyespot increased with the frequency of wheat and barley in the 2 yr. preceding, but a few infected crops occurred on fields not in these grains for many years. In Scotland, where there is greater humidity, eyespot tends to increase more rapidly than in similar rotations in England; lesions are found higher up on the straw, and the disease is more prevalent on spring-sown barley. The long rotations practiced in Scotland prevent more extensive damage by eyespot.

Response of spring barley varieties to floral loose smut inoculation, H. L. SHANDS and C. W. SCHALLER. (Wis. Expt. Sta.). (*Phytopathology*, **36** (1946), No. 7, pp. 534-548).—Several methods of inoculating barley varieties with loose smut were compared. The most effective and easily manipulated technic consisted of injecting dry spores into the flowers via a hypodermic needle attached to a small rubber bulb containing chlamydospores; this "needle" method was used in testing the reactions of 300 barley varieties from the C. I. collection. Wide varietal differences in percentage of infection were found, several being highly resistant; Abyssinia was the source of more resistant varieties than any other country. The loose smut reactions of several commercial varieties are given; also listed are 17 varieties that had less than 15 percent of stripe and loose smut. In tests of many smooth-awned selections from the breeding program, some having fairly good agronomic type have proved resistant.

Una nueva enfermedad del haba (*Vicia faba* L.) en el Perú [A new disease of broadbean in Peru], C. BAZAN DE SEGURA (*Agronomía [Lima]*, **10** (1945), No. 42, pp. 49-52, illus. 3; *Eng. abs.*, p. 52).—The existence of a new disease of broadbean ascribed to *Phoma* sp. is reported for Peru.

The slurry method for treating seed corn, G. F. MILES (*Agr. News Letter*, **14** (1946), No. 4, pp. 71-74).—Seed processors, aided by manufacturers of seed-treating chemicals and equipment, are making substantial progress in overcoming some of the obstacles to economical, safe, and efficient seed-treating operations. An example is the recent development of a new and superior method of treating seed corn which required the designing and constructing of a new type of seed treater as well as the development of a new chemical formulation. The new method—called the slurry method—involves application of the disinfectant to the seed in the form of an aqueous suspension or slurry instead of as a dust or powder. In a field test in Iowa (1945) under very unfavorable soil conditions as to temperature and moisture the average percentage increase in stand over untreated seed was 79.4 for the slurry method and 67.2 for the Arasan dust. Again, under the severe conditions of 1945 in Illinois, 12 lots of hybrids gave an average percentage increase in stand over untreated seed of 305.7 for the slurry and 279 for the Arasan dust.

Lespedeza anthracnose, J. L. WEIMER. (Ga. Expt. Sta. coop. U. S. D. A.). (*Phytopathology*, **36** (1946), No. 7, pp. 524-533, illus. 3).—The author describes an anthracnose of annual lespedeza caused by a strain of *Glomerella cingulata*, which induces more or less circular, elliptical, or angular brownish lesions from 1 to 5 mm. in diameter on the leaflets. The number of spots per

leaflet may vary greatly, but one is sufficient to cause a leaflet to fall. The lesions on petioles and stems are dark brown to nearly black and vary from circular to linear; they are important principally on young seedlings, since the stems may be completely girdled. The disease may be very prevalent in local areas during wet periods, especially in the late spring and early summer months; it may disappear during subsequent dry spells. Strains of *L. striata* appear to be more susceptible than those of *L. stipulacea*, although some of the latter are moderately so. It is believed that—should control measures become necessary—resistant varieties may be found among some of the strains of the latter species, such as F. C. 31249.

Field trials of copper fungicides for the control of potato blight.—II, Spray retention, E. C. LARGE, W. J. BEER, and J. B. E. PATTERSON (*Ann. Appl. Biol.*, **33** (1946), No. 1, pp. 54–63, illus. 2).—In this study (E. S. R., 95, p. 68), spray-retention estimates were made during four seasons in England on main-crop potatoes sprayed with about 120 gal. per acre for the first and 160 gal. for the second application. Evidence is given on the limits of reliability of the disk method of leaf sampling, and an alternative method—battery washing—is described. With 2.5 to 3.5 in. of rain over test periods of 3 to 4 weeks, 1 percent bordeaux gave about 40 percent spray retention; cuprous oxide and copper oxychloride sprays at the same Cu dosage but compounded with sulfite lye or other water-soluble dispersing agent showed less than 20 percent retention. Compounding these materials with a bentonite improved the retention. The percentage retention of 0.5 percent bordeaux proved to be less than that of the usual 1 percent formula, but adequate spray deposits could be maintained with this and other low-Cu fungicides by more frequent applications. A rapid method for determining total foliage expanse is described, and the importance of such determinations in connection with spray-retention trials and practical spray timing is stressed. In tests to determine whether Cu is absorbed by potato leaves from the spray deposits, absorption—or acid-resistant adsorption—of the order 0.02 mg. Cu per 120 sq. cm. of leaf area was indicated.

Soft rot of potatoes in 1945 crops, F. T. BENNETT (*Agriculture, Jour. Min. Agr. [Gt. Brit.]*, **53** (1946), No. 2, pp. 56–58).—An epidemic of soft rot in potato tubers was observed in widely separated districts of England in November 1945; from typical specimens an organism of the *Bacterium carotovorum-phytophthorum* type was isolated. The epidemic was associated with immature tubers, the immaturity being a result of seasonal conditions; the earlier the harvesting, the greater was the liability to rotting. The rot spread among immature tubers under lack of air, high temperature, moist air, and pressure. Sound tubers sorted out of consignments or clamps—after the necessary maturation period—were safely used for seed. Killing of the haulm by spraying—followed by the requisite period for maturation of the tubers in the soil—is recommended; this also reduced the incidence of late blight, which itself predisposes to soft rot.

Varietal differences in susceptibility to potato virus Y, F. C. BAWDEN and B. KASSANIS (*Ann. Appl. Biol.*, **33** (1946), No. 1, pp. 46–50).—Besides giving different kinds of symptoms when infected with this virus, individual potato varieties also differed in their susceptibility, in the virus concentration attained in their sap, and in their efficiency as virus sources for aphids. Their relative susceptibility in the open when exposed to equal chances of infection was correlated with the ease with which they became infected when colonized with infective aphids and could be assessed from tests made under glass. Methods for making such tests are described; they need few tubers and are

said to give reproducible results. It is considered that they could be applied in studying the inheritance of this type of resistance and to test the behavior of new seedlings. The variety Katahdin proved the most resistant of any tested, but there were significant differences among commercial British varieties. In the open, all varieties were equally colonized by aphids, and resistance to infection with virus Y was not correlated with resistance to leaf roll.

Verticillium wilt of sainfoin, I. ISAAC (*Ann. Appl. Biol.*, **33** (1946), No. 1, pp. 28-34, illus. 6).—A wilt disease of sainfoin caused by *Verticillium dahliae* is described, and it is shown that the fungus can penetrate seedlings through unwounded roots as well as through ruptures from the emergence of lateral rootlets. The fungus was isolated from spontaneously infected soil only in June-August, though *V. nigrescens* was obtained throughout the year. Comparative studies of the longevity of these two fungi and *V. albo-atrum* proved them all to be viable for at least 3 yr. on agar media. On sterilized wheat grains *V. dahliae* died within 8 weeks after inoculation, *V. albo-atrum* and *V. nigrescens* within 12 weeks, and the hyaline variants of the first two after 6 mo. Evidence was obtained that in artificially inoculated soil *V. dahliae* persists mainly as microsclerotia; it may also exist in the soil as hyaline mycelium or conidia, but for only a relatively short time. The incidence of this disease of sainfoin was reduced by increasing the soil-water content, but was unaffected by applying lime.

Seed transmission of bacterial blight of sugar beet, P. A. ARK and L. D. LEACH. (Univ. Calif.). (*Phytopathology*, **36** (1946), No. 7, pp. 549-553, illus. 1).—Bacterial blight—caused by *Phytomonas aptata* and previously described as a leaf spot of sugar beet—is here shown to involve also a blighting of the leaves, black streaking of the seed stalks, and internal root necrosis. Seed from blighted stalks were found heavily contaminated with the bacterium and produced diseased plants on germination. Seed transmission was prevented by using a New Improved Ceresan dust or dip, or an Arasan dust. Swiss chard and broadbean are added to the plants previously reported to be susceptible.

Some causes of chlorosis and necrosis of sugar-beet foliage, J. B. HALE, M. A. WATSON, and R. HULL (*Ann. Appl. Biol.*, **33** (1946), No. 1, pp. 13-28, illus. 15).—Experiments in which diagnosis was confirmed by serological and spectrochemical methods revealed that the two most easily confused diseases—sugar beet virus yellows and Mg deficiency—can be visually distinguished. Yellows reduces the K, but slightly increases the Mg, content of the leaves. Mg-deficiency symptoms are associated with a low Mg content of the foliage, but may be induced by salt applications without greatly affecting the Mg analysis. K-deficiency symptoms are often but not necessarily associated with a low K analysis and may actually be caused solely by a deficiency in Na. In the field, symptoms are induced by $(\text{NH}_4)_2\text{SO}_4$ and phosphate applications and may be prevented in some cases by applying either salt or muriate of potash; in others, by salt only. Some interchangeability of the functions of K and Na in the plant is suggested. Mn-deficiency symptoms are associated with a low Mn content of the leaves which can be readily increased by spraying or injecting MnSO_4 solution, but a high concentration of Mn in the foliage—such as sometimes occurs naturally on acid soils—has a toxic effect.

La pourriture visqueuse de la betterave gelée—l'agent producteur de la fructosane, *Phytomonas betae-gelatae* n. sp. [The viscous rot of frozen beets—the agent producing fructosan, *P. betae-gelatae*, n. sp.], B. DELAPORTE and H. BELVAL (*Compt. Rend. Acad. Sci. [Paris]*, **222** (1946), No. 17, pp. 1011-

1013).—The authors describe *P. betae-gelatae* n. sp., considered nonpathogenic in the sense that it invades only those tissues killed by cold or heat.

Disease testing and initial seedling selection work at the Houma Station during 1945, E. V. ABBOTT and E. M. SUMMERS. (U. S. D. A.). (*Sugar Bul.*, 24 (1946), No. 13, pp. 137A-138A).—A brief progress report on the sugarcane disease situation in commercial varieties, principal crosses studied, and seedlings under pathology test in 1945 (E. S. R., 94, p. 72) at Houma, La.

An electron microscope study of tobacco mosaic virus at different stages of infection, T. E. RAWLINS, C. ROBERTS, and N. M. UTECH. (Univ. Calif.). (*Amer. Jour. Bot.*, 33 (1946), No. 5, pp. 356-363, illus. 8).—Electron microscope studies confirmed E. L. Spencer's sedimentation studies indicating that purified tobacco mosaic virus preparations from leaves infected for 5 days usually contained a higher proportion of double-length particles than did similar virus preparations from leaves infected 20 days. It was not found possible to prove definitely whether the double-length particles resulted from gradual elongation of virus particles while in the host or from end-to-end aggregation of two typical particles having a length of about 300 m μ ; most of the evidence appeared to favor the latter explanation. The prevalence of particles longer than 450 m μ in 5-day virus may explain the results of W. M. Stanley and of Spencer in which they found fewer local lesions induced by a given weight of purified 7- and 5-day viruses than by the same weight of 28- and 20-day viruses. The authors' findings indicate that purification by alternate high- and low-speed centrifugation while the virus is suspended in dilute phosphate-HCl solution causes less end-to-end aggregation than similar purification of virus suspended in distilled water. A very high proportion of tobacco mosaic virus particles regularly have a length around 300 m μ ; their length appeared to have been very accurately controlled by some factors keeping the length within narrow limits but not producing particles of exactly the same length. The evidence available indicates that particles of this length were present in the host plant. It appears improbable that these particles—showing so little variation in length—have been formed by the end-to-end aggregation of shorter virus particles. Storage of purified virus for about 12 mo. in distilled water at 1° C. failed to cause any detectable aggregation of particles.

Rust and phosphorus distribution in wheat leaves, D. GOTTLIEB and J. M. GARNER (*Phytopathology*, 36 (1946), No. 7, pp. 557-564, illus. 1).—No consistent differences in total content of radiophosphorus were observed between entire rusted (*Puccinia graminis tritici*) v. healthy wheat leaves. In inoculated leaves the differences in P content between the infected distal portion and the noninfected basal portion of the leaves were much greater than the differences of similar areas in healthy plants, the distal parts always containing more P. The P was accumulated in rusted parts of leaves and concentrated in the invaded areas. The concentration of radiophosphorus in the urediospores was less than in the leaves.

Studies on vegetable seed treatments in 1944: Report by Vegetable Seed Treatment Sub-committee of the Seed Treatment Committee of the American Phytopathological Society (U. S. Dept. Agr., *Plant Disease Rptr.*, 1946, Sup. 161, pp. 66+).—During 1944, 236 uniform seed treatment tests were conducted by 40 cooperators in 29 States and 2 Canadian provinces on 10 vegetable crops (edible soybeans, beets, carrots, cucumber, lettuce, onions, peas, spinach, sweet corn, and tomato) as part of a cooperative project started in 1940. In each case seeds from a single lot were treated by a crop leader at specified dosages and in a uniform manner with 3 or more seed protectants

and distributed to cooperators who conducted germination tests in soil using 5 replications of 100 seeds each. The detailed results for the several crops are here presented separately by the respective crop leaders, and are also briefly summarized by the committee.

Reducing the loss from disease in the home garden, J. T. PRESLEY (*Miss. Farm Res. [Mississippi Sta.]*, 9 (1946), No. 2, pp. 1, 6).—A brief outline of diseases of the principal home garden crops, with recommended control by resistant varieties or protectants for seed or plant treatment.

DDT residues on fruits and vegetables, G. D. MANALO, R. HUTSON, and E. J. BENNE (*Michigan Sta. Quart. Bul.*, 28 (1946), No. 4, pp. 272-280; also in *Canner*, 103 (1946), No. 2, pp. 10-11, 22).—The preliminary findings from this investigation are reported to have shown conclusively that DDT sprays and dusts left varying amounts of residue which bore no direct quantitative relationship to the number of applications. Moreover, the amount of residual DDT failed to decrease proportionately with the length of time between the last application and harvest. Hence, analysis for the amount of DDT in a food is the only safe guide for determining whether it is fit for human consumption. The development and adaptation of methods for the chemical determination of DDT are believed not to have kept pace with the extensive investigations of its effectiveness as an insecticide; numerous aspects of the residue problem still require study.

The facts about disease resistant vegetables, J. D. WILSON (*Home Garden*, 7 (1946), No. 2, pp. 19-23).—The author lists varieties known to be resistant to certain plant diseases among the following types of vegetables: Asparagus, beans, beets, cabbage, carrots, celery, corn, cucumbers, eggplant, lettuce, muskmelon, onions, peas, peppers, potatoes, spinach, sweetpotatoes, squash, tomatoes, and watermelons.

Bud, blossom, and pod drop of canning string beans reduced by plant hormones, E. H. FISHER, A. J. RIKER, and T. C. ALLEN. (*Wis. Expt. Sta.*). (*Phytopathology*, 36 (1946), No. 7, pp. 504-523, illus. 2).—Various hormones were tried in Wisconsin to prevent bud, blossom, and small pod drop of canning beans and consequent reductions in yields. As a laboratory screening technic to test the abscission-prevention abilities of hormones, abscission layers were readily induced on bean plants by treating with illuminating gas, 1 part in 135 parts of air, for about a day at 84° to 86° F. α -Naphthaleneacetic and 2,4-dichlorophenoxyacetic acids were the most promising hormones employed. Too strong concentrations not only prevented the formation of abscission layers but also induced a vein clearing, distortion, and dwarfing of leaflets suggesting virus infection. *Lygus oblineatus* induced bud, blossom, and small bean drop and distorted and dwarfed small leaflets of caged greenhouse and field plants; some of this damage was prevented by dusting with α -naphthaleneacetic acid. An increase of about 18 percent in yield of field-grown wax beans was secured in 1942 with two applications of dust containing α -naphthaleneacetic acid at 70 p. p. m. in one case and at 140 p. p. m. in another; rain soon followed both applications. Dust on Refugee beans and spray on both Refugee and wax beans were not helpful. Field trials in 1943 showed 24 and 12 percent yield increases, respectively, of wax beans with two applications of dusts containing α -naphthaleneacetic acid at 40 and 80 p. p. m. but showed a decrease with dusts at 160 p. p. m. and with sprays. Yield increases were due to a greater number of small high-grade beans rather than to larger beans.

Lygus bug injury of lima bean in California, K. F. BAKER, W. C. SNYDER, and A. H. HOLLAND. (*Univ. Calif. et al.*). (*Phytopathology*, 36 (1946),

No. 7, pp. 493-503, illus. 2).—California-grown large and baby lima beans usually have a necrotic pitting of the seed indistinguishable from infection by *Nematospora* except for the absence of the pathogen in the lesions. As much as 16.1 percent of the seed has been pitted, with up to 52 punctures per seed; similar damage occurs on blackeye cowpea. Field and greenhouse tests demonstrated the pits to result from toxic feeding of *Lygus* bugs (*L. hesperus*, *L. elisus*, and perhaps others). The insects also cause a serious shedding of blossoms and small pods and some shriveling of the young seeds. Reduction of the injury by an application of DDT dust resulted in significant increases in number of pods, number and weight of beans, and percentage of unpitted seeds. Injury tended to be worst in fields adjacent to established perennial favored hosts, e. g., sugar beets and alfalfa. In some areas the bugs may be present for a relatively short time on lima beans, injuring only part of the pods set or only a portion of a field; in other areas the pest remains active throughout the season, injuring most of the pods in whole fields. The possible involvement of an insect toxin in the lima bean yeast spot of other areas seems not to have been excluded. There are 30 references.

Phomopsis fruit rot of eggplants: Seed treatment and other methods of control (*New Jersey Stas. Plant Disease Notes*, 23 (1946), No. 3, pp. 9-12).—*Phomopsis vexans* is so deep-seated in the seed that chemical treatments have proved ineffective, as did also aging of the seed. On the other hand, seed treated in hot water at 50° C. for 50 min. or at 55° for 15 min. were freed of the pathogen; if planted in clean seedbeds infection from this source is thus eliminated, though the seedlings may become infected from contaminated refuse or from soil- or wind-borne spores. Several other methods of reducing the disease are noted; though none of them have proved very effective.

The effect of seed treatment and dates of seeding on the emergence and yield of peas, R. J. LEDINGHAM (*Sci. Agr.*, 26 (1946), No. 6, pp. 248-257, illus. 1).—Seed treatment of garden peas proved conducive to increased emergence and sometimes to increased yields at Saskatoon, Sask. The early-sown peas emerged better than the later, and seed treatment had its greatest effect on the later. With total yields for the season as a basis, only the severe reductions in emergence were reflected in reduced yields. Yields at the first date of harvest were, however, much more closely indicative of emergence; in most cases the treated rows produced heavier yields than the untreated ones at this harvesting date. Comparison of emergence data with moisture conditions at the different planting dates and with temperatures prevailing during the germination phase indicated that the emergence correlated fairly well with the temperature but not with the moisture. According to the findings, soil temperature may be considered an important factor in determining the emergence of garden peas. Limited tests with smooth-seeded field pea varieties showed them to be favored by higher temperatures than were garden peas during the germination phase.

Klornitrobenzol-Forbindelser som Middel mod Kaalbrok, Kartoffelskurv, Kløver-Baegervamp og "Brune Rødder" paa Tomat (Chlornitrobenzene for control of club-root, potato scab, clover stemrot, and brown root-rot of tomato), E. GRAM (*Tidsskr. Planteavl*, 49 (1944), No. 1, pp. 118-143, illus. 6; *Eng. abs.*, p. 143).—In control against clubroot (*Plasmodiophora brassicae*), Brassicol (pentachlornitrobenzene), Brassisan (dinitrotrichlorbenzene), and another chlornitrobenzene showed distinct effects. The effects on potato scab (*Actinomyces scabies*) were less pronounced, but promising results were obtained with the first, which exhibited a residual effect on potatoes grown in plots the following year; this preparation plus $(\text{NH}_4)_2\text{SO}_4$ could be used with advantage

for scab control. Brassicol also reduced the formation of *Rhizoctonia solani* sclerotia on the tubers. Dusting with Brassicol alone or diluted with talc proved effective against clover stem rot (*Sclerotinia trifoliorum*); with a portable rotation duster, one man could treat 1 ha. of a clover seed field in 3 hr. Used as a soil disinfectant in the greenhouse, Brassicol applied just before planting tomatoes prevented to some extent the development of brown root rot; Brassisan was less effective.

Control of anthracnose on cannery tomatoes—two years' results, D. M. MCLEAN and E. H. BJORNSETH (*Michigan Sta. Quart. Bul.*, 28 (1946), No. 4, pp. 287–293, illus. 1).—*Colletotrichum phomoides* infection is considered the most destructive tomato fruit disease in the more important eastern canning districts; it also causes considerable losses in Indiana, Ohio, and Michigan. The symptoms and host-parasite relations are described. This paper reports primarily on the 1945 experiments in Michigan, the results of which indicate that Fermate may be expected to give considerable control of anthracnose but that it fails to give adequate results against leaf diseases. It was indicated that Zerlate (zinc dimethyl-dithiocarbamate) may be more efficient against both leaf diseases and anthracnose; since it is essential to control leaf diseases as well as fruit rots, the manner in which these two fungicides should best be fitted into a general control program remains to be determined. Different tomato varieties and the same variety planted on different dates do not ripen their fruits during the same periods; that, as well as seasonal variations, suggests that spray schedules should be timed to correspond with the stages of plant growth or fruit development. In general, the first application should be applied not later than 30 days after development of the first blossom cluster or when the fruits of the first cluster are about half to three-fourths full size; others should follow at about 10-day intervals until five treatments have been given.

Tomato blight control in southwest Virginia, R. G. HENDERSON (*Virginia Sta. Bul.* 394 (1946), pp. 9, illus. 3).—Early blight, septoria leaf spot, and late blight are extremely destructive on tomatoes nearly every year in this area. Spraying or dusting the foliage and fruits with fixed copper fungicides (e. g., cuprous oxide and tribasic copper sulfate) were found to keep these diseases under control. Tomatoes in the home garden should be dusted or sprayed regularly every year; in commercial plantings they should also be treated if the unit price anticipated is sufficient to justify the expense. The fungicide can be applied more quickly and with greater ease as a dust, a hand-operated crank-type duster being suitable for the home or small commercial planting but a motor-driven duster or power sprayer better for larger plantings. The dust mixture should contain about 5 percent metallic Cu, with pyrophyllite or talc as the diluent. The spray mixture should be prepared according to the directions on the package; use yellow cuprous oxide at the rate of 1.5 lb. to 100 gal. water and tribasic copper sulfate at 3 lb. to 100 gal. Dust and spray when the wind is not blowing; dusts may be applied with the foliage wet or dry, but the spray should be applied only when it is dry. The first application should be made about 10 to 14 days after setting in the field, with other treatments following at 7- to 10-day intervals; five to seven applications will usually be required for satisfactory control.

The treatment of little-leaf of deciduous fruit trees, K. M. WARD (*Queensland Dept. Agr. and Stock, Div. Plant Indus. (Res.) Bul.* 21 (1944), pp. 1–18, illus. 6).—In trials of methods of applying Zn as a corrective, a winter spray consisting of a 5 percent aqueous solution of $ZnSO_4$ gave satisfactory responses within a few months; little control followed use of a 1 percent

solution. Spring foliage sprays containing up to 2 percent ZnSO_4 gave little or no immediate benefit; winter sprays not only produced an earlier response but had more lasting effects. Broadcasting and plowing under 5 lb. ZnSO_4 around an affected tree were followed by beneficial effects in the second and third years thereafter; tree injections proved unsatisfactory. Probably winter spraying and soil treatment in conjunction would be preferable to winter spraying alone in the early treatment of the disorder.

Boron deficiency in pears—symptoms and control measures, S. W. FERGUSON and J. A. HOLBECHE (*Agr. Gaz. N. S. Wales*, 57 (1946), No. 5, pp. 241-243, illus. 7).—In the Kentucky district of New South Wales tests have shown that many of the disorders causing serious crop losses in pears were directly due to B deficiency; tree growth was also retarded—in some instances seriously. Borax applied to the soil or as a spray gave complete control, even severely affected trees soon commencing to grow vigorously. The tree and fruit symptoms of B deficiency in pears are described and illustrated.

Bacterial canker of stone fruit, F. L. MILLTHORPE and A. E. VINCENT (*Agr. Gaz. N. S. Wales*, 57 (1946), No. 5, pp. 255-257, illus. 9).—Bacterial canker (*Pseudomonas cerasi pruni*) is reported to occur on stone fruits throughout New South Wales, with serious losses on apricot, cherry, nectarine, peach, and plum trees. The symptoms and tentative control measures are discussed.

Apricot leaf scorch in Utah County, F. B. WANN (*Farm and Home Sci. [Utah Sta.]*, 7 (1946), No. 2, pp. 5, 14-16, illus. 2).—In the early summer of 1944 a severe marginal burning of apricot leaves was observed in this county; in advanced stages the appearance suggested a scorching as by fire, hence the name, "leaf scorch." The effect on the trees was serious. The symptoms are described in detail, the distribution of the disorder in the State is outlined, and the possible causes—atmospheric conditions, mineral nutrient deficiency, rootstock relations, virus infection—are discussed. Though the cause is still undetermined, the most likely explanation appears to be a combination of soil and meteorological conditions.

Bacterial spot of peach and its behavior in Delaware, S. L. HOPPERSTEAD and T. F. MANNS (*Delaware Sta. Bul.* 258 (1945), pp. 24, illus. 8).—Data from the experiments and observations here discussed are believed to warrant the following conclusions: The casual organism, *Xanthomonas pruni*, is readily carried to healthy peach stock by buds from infected trees; the organism is readily carried in the buds proper and in the base of the buds during June-August, and it is also present in the lateral buds of peach during the early part of the dormant season; it may overwinter in the lateral buds of peach trees stored in sheds pending spring shipment; infected trees may be freed of infection by growing them under the dry conditions of the greenhouse and subirrigated or they may be grown in arid regions until determinations by culture indicate the organism is absent; a small percentage of terminal buds overwinter *X. pruni* under Delaware field conditions, but the lateral buds do not; and primary infections in the State are largely associated with infected terminal buds. There are 26 references.

Resolution of strawberry virus complexes by means of the aphid vector *Capitophorus fragariae* Theob., I. W. PRENTICE and R. V. HARRIS (*Ann. Appl. Biol.*, 33 (1946), No. 1, pp. 50-53, illus. 4).—Aphids were fed up to 24 hr. on strawberry plants with mild crinkle, severe crinkle, or yellow edge and then transferred to wild (*Fragaria vesca*) or cultivated (Royal Sovereign variety) strawberry plants. On *F. vesca* the symptoms were chlorotic speckling, leaf distortions, and dwarfing of varying intensity; on Royal Sovereign, scattered inconspicuous diffuse chlorotic spots. The symptoms from all three

infection sources were similar and indistinguishable from those of the mild crinkle of Harris and King; the virus thus selectively transmitted is tentatively concluded to be the mild crinkle virus. It was transmitted after feeding periods of 1 hr. or more and failed usually to persist in the vector for more than 3 hr.

Summary of chlorosis experiments with grapes at the Southern Great Plains Field Station, Woodward, Okla., L. F. LOCKE. (U. S. D. A.). (Oklahoma Sta. Bul. 295 (1946), pp. 23-28).—On the basis of the experiments reported, mulches are not recommended as a control measure; the manure mulch proved actually harmful. Only FeSO_4 (copperas) sprays were effective; frequent applications on both grape and spirea reduced the chlorosis most; Zn and Ca sprays—alone or combined—were of no benefit. All chemical treatments of grapes at 0.25 to 2 lb. of chemical applied to the soil failed. Al, NH₄, or Mg sulfates were also of no benefit. Commercial ZnSO_4 at 5 lb. per vine in solution applied to the soil gave only very slight signs of benefit. Iron sulfate gave definite ameliorative results at 5 lb. per vine; quicker results followed application in solution than the same or larger amounts used dry, but the effects lasted a shorter time. Single applications at 5 to 60 lb. per vine in solution controlled the chlorotic condition without injury to the plants. This chemical applied in solution to the soil was also effective for Vanhouttei spirea, but apparently must be used with more caution than for grapes. Soil treatments with FeSO_4 have also shown benefits on 120 species and varieties of trees and shrubs and numerous annual and perennial flowers.

A ganoderma root rot of citrus, F. W. BLACKFORD (Queensland Dept. Agr. and Stock, Div. Plant Indus. (Res.) Bul. 22 (1944), pp. 19-23, illus. 3).—The cause of root rot here reported and described was identified as *Ganoderma lucidum*.

O teste do iodo na identificação da "tristeza" dos citruss [The iodine test for identifying the tristeza disease of citrus], V. ROSSETTI (Biológico, 11 (1945), No. 1, pp. 13-21, illus. 1).—An account of large-scale confirmatory trials in various localities of the iodine test of Bitancourt previously noted (E. S. R., 92, p. 381).

Sobre la podredumbre de las raicillas de los citros [On the decay of rootlets of citrus trees] (La Chacra [Buenos Aires], 15 (1945), No. 180, pp. 30-31, illus. 3).—A note of rootlet rot of citrus trees, also called tristeza, and the relation of nematodes to it.

A new species of Sphaceloma causing scab of plantain (Plantago), A. E. JENKINS and A. A. BITANCOURT. (U. S. D. A. et al.). (Jour. Wash. Acad. Sci., 36 (1946), No. 7, pp. 225-227, illus. 1).—*S. plantaginis* n. sp. on *Plantago* spp. is described and illustrated.

A previously undescribed fungus causing a leaf spot of bamboo, L. SHANOR (Mycologia, 38 (1946), No. 3, pp. 331-338, illus. 8).—The pycnidial stage of this fungus on leaves of *Arthrostylidium racemiflorum* is described as *Ciliochorella bambusarum* n. sp., and the ascocarpic stage—a hemisphaeriaceous fungus—as *Lateropeltis bambusarum* n. gen. and sp. The ascogenous stage is not known to occur except in conjunction with the pycnidial phase.

Diseases of cultivated guayule and their control, W. A. CAMPBELL and J. T. PRESLEY (U. S. Dept. Agr. Cir. 749 (1946), pp. 42, illus. 7).—The authors obtained information on guayule diseases during 1942-45 from observations on 2,000 acres of nurseries, 30,000 of field plantings, and from greenhouse, laboratory, and field experiments. On most irrigated and nonirrigated well-drained soils losses from disease were unimportant in the production of nursery or field-grown guayule. Serious losses occurred, however, on poorly

drained irrigated soils or on well-drained soils when excessive amounts of water were applied. Careful control of irrigation proved necessary to the avoidance of disease losses on many irrigated plantings. The most important nursery diseases were those caused by *Pythium ultimum*, *Sclerotinia sclerotiorum*, *S. minor*, *Botrytis cinerea*, and *Verticillium albo-atrum*. The disease losses in guayule plantations were due mainly to root rots, the more important of which were due to *Phytophthora drechsleri*, *Phymatotrichum omnivorum*, and an unidentified bacterium. Other fungi pathogenic to guayule were *Sclerotium bataticola*—cause of a crown rot on dry land plantings in Texas during hot dry weather, *S. rolfsii*, *Sclerotinia* spp., and *Diplodia theobromae*—attacking guayule in southern Texas in late summer and fall, and *Puccinia parthenii*—known only from Mexico. Strain 109 in field plantings proved very susceptible to *V. albo-atrum*, strain 405 was resistant, and strain 593—the one most commonly planted—was intermediate in susceptibility.

Diplodia die-back of guayule (*Parthenium argentatum* Gray), J. T. PRESLEY. (Miss. Expt. Sta.). (*Phytopathology*, 36 (1946), No. 7, pp. 565–571, illus. 2).—*D. theobromae* caused a severe dieback of a 2-year-old irrigated guayule in southern Texas during late summer and early fall, 1944; younger irrigated shrubs and 2-year-old shrubs on dry-land plantings were not appreciably affected. Inoculation tests revealed that spores in the soil could cause the loss of small seedlings, especially at 80° F. Leaf and twig infections in the greenhouse depended on high humidity for 24 hr. or more and temperatures of 80° to 90°. Hardened plants with old dry leaves proved more susceptible than young succulent plants with active green leaves.

A curious fungus on *Opuntia*, B. O. DODGE (*Bul. Torrey Bot. Club*, 73 (1946), No. 3, pp. 219–223, illus. 2).—*Tretopileus opuntiae* n. gen. and sp.—a fungus of as yet undetermined relationships occurring on pads of *O. ammophila*—is described and illustrated; it was clearly not very destructive to its host.

The control of narcissus leaf diseases.—III, *Sclerotinia polyblastis* Greg. on *Narcissus tazetta* var. *Soleil d'Or*, P. H. GREGORY and G. W. GIBSON (*Ann. Appl. Biol.*, 33 (1946), No. 1, pp. 40–45).—In this contribution (E. S. R., 85, p. 370), the author reports that in southwestern England *N. tazetta* grown for the outdoor flower crop is regularly attacked by “narcissus fire” (*S. polyblastis*). A randomized strip test on the variety *Soleil d'Or* begun in 1937, in which half of the plots were sprayed with bordeaux each season, gave data as to the effect of controlling the disease on the number and quality of the flowers produced in 1939–41 and on the weight and grade of bulbs lifted in 1941. There was an average increase of 26 percent in the number of flowers on sprayed plots and a 35 percent increase in weight of bulbs. There was no evidence of any cumulative improvement, because most of the gain in one year appeared to have been immediately expended in increased flower production the following season; the sprayed plots, however, maintained a higher general level throughout. The quality was improved by spraying, mainly by addition to the inflorescence of an average of one extra “bell.” Though not cumulative, there was a residual effect shown by the increased yield of bulbs in 1941 after a season in which only one postflowering spray had been applied. The effect of treatment on the date of flowering (anthesis) was negligible, and its direction depended on the season. In this respect *Soleil d'Or* differs from *Golden Spur*, in which spraying induced a marked retardation of flowering 1938–39.

Epidemic tree diseases threatening shade trees in Michigan, F. C. STRONG. (Mich. State Col.). (*Mich. Forestry and Park Assoc. Ann. Mtg.*, 20 (1946),

pp. 7-19).—This paper summarizes the present status of knowledge on the losses caused from, and the present distribution in the United States, hosts, cause, symptoms, vectors, and control of, the Dutch elm disease, phloem necrosis of elms, oak wilt, and maple wilt. Remarks in response to the paper are by H. Chapel (pp. 11-13).

As galhas pulverulentas das Lauraceas (The powdery galls of the Lauraceae), A. A. BITANCOURT and V. ROSSETTI (*Biológico*, 12 (1946), No. 3, pp. 55-62, *illus.* 3; *Eng. abs.*, p. 61).—In Neotropical forests, trees of several genera of the laurel family (*Nectandra*, *Ocotea*, *Cryptocarya*, etc.) often exhibit in spring and summer galls induced by fungi which have been variously placed among the Peronosporaceae, Melanconiaceae, Basidiomycetes, etc.; their inclusion under the last-named group is believed warranted by their morphological characteristics. In São Paulo the following species causing galls have been observed since 1941: *Drepanoconis larviformis*, causing chalk-white powdery galls on the young sprouts, stems, leaves and pistils or young fruits; *Clinoconidium farinosum*, dark brown powdery galls on young stems; *Clinoconidium* sp., warty galls on the leaves; *Botryoconis saccardoi*, brown galls on the stems; and *B. pallida*, whitish powdery galls on the fruits, and an undescribed fungus of the same group causing a yellowish powdery gall on the stems.

Effect of mineral nutrition on the vigor and susceptibility to blight of old Japanese chestnut trees, J. D. DILLER, C. W. WHITTAKER, and M. S. ANDERSON. (U. S. D. A.). (*Phytopathology*, 36 (1946), No 7, pp. 554-556).—Varying fertilizer treatments were applied to 64 50-year-old Japanese chestnut trees, which were later inoculated with isolates of the chestnut blight fungus (*Endothia parasitica*) from Massachusetts and Maryland. No significant effect on shoot growth resulted from applications of K or P; N at the rate of 150 lb. per acre was without effect but 300 lb. increased the shoot growth in 1944, though a second application in 1945 had no significant effect. There was no correlation between shoot growth and trunk diameter, nor was any connection observed between canker size and fertilizer treatments. No significant difference occurred between Massachusetts and Maryland isolates as to the size and total number of cankers produced; the longer established Massachusetts cultures were as virulent as the younger Maryland isolates. Fertilization with K and P a year previous to inoculation increased the incidence of and susceptibility to canker, but this effect was modified in a complicated manner by a N treatment. Field observations made during six growing seasons revealed KCl to be an unfavorable form of potash for chestnuts; the effects noted may have been connected with some toxic effect of the chloride ion.

ECONOMIC ZOOLOGY—ENTOMOLOGY

Pittman-Robertson contributions to forest game restoration and management, R. M. RUTHERFORD (*Jour. Forestry*, 44 (1946), No. 6, pp. 419-423).—The Federal Aid in Wildlife Restoration Act of September 2, 1937—popularly known as the Pittman-Robertson Act—was designed to provide aid to the States in the restoration of wildlife. This article reviews the program to date, with the conclusion that it has resulted in substantial progress toward better management of forest wildlife and in bringing back vanished species to habitats suitable for them.

Game (Nova Scotia Dept. Lands and Forests Rpt., 1945, pp. 76-109, *illus.* 3).—This is a report on game in Nova Scotia for 1945, including information on moose, deer, beaver, partridge, pheasants, rabbits, bears, muskrats, silver foxes, fur-bearing animals and fur farming, game sanctuaries, statistical

data on licenses, etc., and a paper entitled *This Predator Legend*, by J. B. Abbott (pp. 87-94).

Pheasants, fox, and quail, I. O. BUSS (*Wis. Conserv. Bul.*, 11 (1946), No. 4, pp. 8-15, illus. 4).—A low pheasant and high quail population was found on a 9,900-acre Wisconsin area during January-February 1946; these contrasting densities fail to support the allegations that fox depredations caused the 1945 pheasant scarcity. Precipitation and temperature records plotted and averaged for the periods before, during, and soon after most pheasant nests were started show a sharp contrast between the 1942 and 1945 minimum temperatures during the time that most pheasant nests are typically started. If all or most pheasants habitually lay first eggs at random, it is entirely possible that low temperatures such as existed from late April through June (1945) inhibit or even prevent pheasants from laying in nests. Such a temperature threshold could explain the latitudinal limits of all pheasant range. Of 453 bobwhite quail trapped on the area, 56 percent were ♂♂; this distorted sex ratio is similar to the 53 and 58 percent ratios reported for Missouri and the Southeastern States. Of 275 quail trapped and aged during 1946, 84 percent were immature (less than a year old); this high percentage of immature birds is similar to the 77 and 83 percent immature bobwhites found in southern Missouri and reflects successful reproduction during the previous breeding season. Weights of 436 bobwhites trapped in the area during January-February (1946) ranged from 154 to 255 gm. and averaged 200 gm.; this is 14 gm. heavier than bobwhites from Missouri and 35 gm. above those in Georgia.

Mammals of the northern Great Plains along the International Boundary in Canada, J. D. SOPER (*Jour. Mammal.*, 27 (1946), No. 2, pp. 127-153, illus. 5).—The author's aim is to give an account of the native mammals inhabiting a relatively broad strip along the International Boundary in Canada from southeastern Manitoba to the foothills of the Rockies. Following notes on the physiography and descriptions of the faunal life zones, local information is presented on the individual species. There are 35 references.

The carnivores of the San Andres Mountains, New Mexico, A. F. HALLORAN (*Jour. Mammal.*, 27 (1946), No. 2, pp. 154-161).—Accounts of the individual species are presented following brief descriptive details on the area, a list of localities, and the number of carnivores present. There are 17 references.

Parasites, diseases, injuries, and anomalies of the Columbian black-tailed deer (*Odocoileus hemionus columbianus* (Richardson)) in British Columbia, I. M. COWAN (*Canad. Jour. Res.*, 24 (1946), No. 3, Sect. D, pp. 71-103, illus. 29).—The occurrences of parasites, parasitic disease, some nonparasitic diseases, and certain anomalous conditions in this species of deer are outlined. The findings are in two categories, viz, those based on a random sample of 40 wild deer and those based on 25 additional deer examined in their entirety and others in part; 25 species of parasites—8 arthropods and 17 helminths—were recovered. The study did not include bacteria or viruses; the only pathogenic micro-organism identified was *Actinomyces israeli*.

On the decoying of coyotes, J. R. ALCORN (*Jour. Mammal.*, 27 (1946), No. 2, pp. 122-126, illus. 1).—A note on the comparative ease with which coyotes may be called up within a few yards of a concealed observer. During August 1944-May 1945, the author decoyed a number of coyotes and a few lynx cats to the vicinity of a blind containing one or two persons by using one or a combination of two of three calls here designated as the "squeak," "howl," and "distress" calls.

The raccoon, a new host for *Microphallus* sp., with additional notes on *M. ovatus* from turtles, R. RAUSCH. (Mich. State Col.). (*Jour. Parasitol.*, 32

(1946), No. 2, pp. 208-209).—A brief note on this trematode as a parasite of raccoons.

Some notes on the life history of the Mexican ground squirrel [*Citellus mexicanus*] in Texas, R. L. EDWARDS (*Jour. Mammal.*, 27 (1946), No. 2, pp. 105-115, illus. 10).

Grey lung virus: An agent pathogenic for mice and other rodents, C. H. ANDREWES and R. E. GLOVER (*Brit. Jour. Expt. Pathol.*, 26 (1945), No. 6, pp. 379-387).—"The two authors of this paper each isolated in the summer of 1944 a mouse-pathogenic virus, one starting with material from a calf pneumonia, the other with some from infantile diarrhea. The two strains seem to be identical and to differ from any virus hitherto described. This 'grey lung' virus may have originated in the normal mouse stock, but subsequent attempts to obtain strains from the normal mice have failed. The virus is strictly pneumotropic, but commonly not fatal, though infective in high dilutions. It produces in the lungs chronic lesions which remain relatively stationary for many months. Suspensions of lungs are infective in high dilutions for at least 9 mo.—the longest period yet tested—after infection of the mice. The virus is contagious for mice running in the same cage as infected ones, but not very highly so. Neither active immunity nor production of antibodies has yet been demonstrated. The virus will produce chronic infection in cotton rats and will infect other rodents, though it is less pathogenic for them. It is relatively stable and will pass a gradocol membrane of A. P. D. [average pore diameter] 450 μ . Differences from other mouse-pathogenic agents are discussed."

Field book of eastern birds, L. A. HAUSMAN (*New York: G. P. Putnam's Sons*, 1946, pp. 659 +, about 500 illus.).—This field book covers the territory roughly east of the Mississippi River and of the west shore of Hudson Bay—i. e., in general, east of the ninetieth meridian.

The blood parasites of the blue grouse, C. D. FOWLE (*Science*, 103 (1946), No. 2685, pp. 708-709).—In blood samples from 44 specimens of blue grouse taken in British Columbia, 4 blood parasites were observed, viz, *Trypanosoma*, *Haemoproteus*, *Leucocytozoon*, and *Microfilaria*. The incidence of infestation is tabulated; mixed infections were found in 7 birds. None of the birds seemed to be suffering any ill effects from infestations by any of these parasites.

A new nematode, *Longistriata caudabullata* n. sp. (Nematoda: Vianaiinae), from the short-tailed shrew (*Blarina brevicauda*), G. DIKMANS. (U. S. D. A.). (*Helminthol. Soc. Wash. Proc.*, 13 (1946), No. 1, pp. 14-16, illus. 1).—This species is here described.

A preliminary report on farm pond management in Michigan, P. I. TACK and W. F. MOROSKY (*Michigan Sta. Quart. Bul.*, 28 (1946), No. 4, pp. 294-303).—This report was prompted by the considerable number of inquiries as to the use of commercial fertilizer to increase fish production in farm ponds. On the basis of a 2-yr. (1944-45) study of farm pond management, it is believed that fertilizer of proper composition for the particular body of water will increase the plankton algae, which in turn will increase the insect population—and this is fish food. Careful management of the fish population utilizing the increased food is considered fully as important as using fertilizer to increase the food supply; the number of fish should be kept down to what will insure maximum growth. The fertilizer formula should be determined for each body of water, or at least for water from several areas of the State. Stocking new ponds should be delayed about 6 weeks after the pond is filled or until the vegetation is thoroughly decayed. These are the main tentative conclusions thus far arrived at.

[Notes on insects and insecticides] (*Jour. Econ. Ent.*, 39 (1946), No. 2, pp. 262-274).—Contributions presented (E. S. R., 95, p. 533) are Some New Insecticides for Potato Insect Control, by G. G. Gyrisco (pp. 262-263) Cornell Univ.); Eradication of Boxwood Leafminer and the Boxwood Psyllid, by L. Pyenson (p. 264); Effect of Various Dust Mixtures on Incidence of the Cabbage Aphid, by G. E. R. Hervey (p. 265) (N. Y. State Expt. Sta.); The Control of Mites on Apple Trees Sprayed With DDT, by W. S. Hough (pp. 266-267, and The Control of the Cowpea Curculio by L. A. Hetrick (pp. 268-269) (both Va. Sta.); Compatibility of DDT and Fungicides on Potatoes, by J. W. Heuberger and L. A. Stearns (pp. 267-268) (Del. Sta.); Individual Comparisons of Grouped Data by Ranking Methods, by F. Wilcoxon (pp. 269-270); Two Industry Problems Caused by Release of DDT, by C. L. Smith (pp. 270-271); DDT and Lead Arsenate Compared for Control of the Pecan Nut Casebearer—1945 Tests, by C. B. Nickels (pp. 272-273) (U. S. D. A.); Sabadilla and DDT To Control the Squash Bug, by R. R. Walton (p. 273) (Okla. Sta.); DDT for Control of a Book Louse, by D. D. Jensen and F. G. Holdaway (p. 274) (Hawaii Sta.); *Hadrobregmus gibbicollis* Infesting Woodwork, by M. H. Hatch (p. 274); and An Early Use of Arsenic as an Insecticide, by J. A. Munro (p. 274) (N. Dak. Agr. Col.).

Chamber for fumigating plants with methyl bromide: Construction and operation, L. L. ENGLISH and G. F. TURNIPSEED (*Alabama Sta. Cir.* 93 (1946), pp. 24, illus. 15).—The authors report the practical details for construction and use of a chamber suitable for fumigating plants with methyl bromide. Materials and special equipment costs total about \$200. Lists of plants which have been fumigated using this equipment without injury, partially or completely defoliated but not killed, and injured too seriously are included.

New formulations of aerosols dispersed by liquefied gases, E. R. MCGOVAN, J. H. FALES, and L. D. GOODHUE. (U. S. D. A.). (*Jour. Econ. Ent.*, 39 (1946), No. 2, pp. 216-219, illus. 1).—Tests of various liquefied-gas aerosol formulas against houseflies and mosquitoes were made in a Peet-Grady chamber; formulas greatly improved in toxicity over the original one were developed by increasing the nonvolatile content and by adding more sesame oil, another synergist (piperonyl cyclohexenone), DDT, benzene hexachloride, and suitable solvents. In small containers, CO₂ proved satisfactory as a propellant.

Particle-size distribution in liquefied-gas aerosols, L. D. GOODHUE and R. L. RILEY. (U. S. D. A.). (*Jour. Econ. Ent.*, 39 (1946), No. 2, pp. 223-226, illus. 6).—By the method described for determining particle size in liquefied-gas aerosols, the particles are collected on oleophobic slides and measured by projecting them on a calibrated cross-hatched screen. The results in volume percent are plotted as cumulative frequency curves. The particle size of an aerosol increases with the concentration of nonvolatile material in the liquefied gas; the type of nozzle also affects it. Nozzles allowing some drop in pressure and partial ebullition before the liquid is expelled have proved the most efficient. Particle-size distribution curves for some aerosols of different compositions are given.

The thermal aerosol fog generator for large scale application of DDT and other insecticides, R. D. GLASGOW and D. L. COLLINS (*Jour. Econ. Ent.*, 39 (1946), No. 2, pp. 227-235, illus. 24).—Notable among the pending, as yet unsolved, and particularly baffling insect pest control problems are those which will apparently require large-scale or regional coverage with appropriate insecticides; well-known examples have to do with the control of such

pests as blackflies, punkies, mosquitoes, sandflies, and similar noxious insects and of the tick and similar vectors of Rocky Mountain spotted fever. The airplane and the helicopter have been put to effective use in special cases, but both at present have definite limitations. A third mechanism—product of the war effort—is the thermal aerosol fog generator; this is said to have possibilities possessed by no other device in the same degree. During the past season (1945) the authors arranged and participated in a fairly comprehensive series of tests with two of the leading mechanisms of this type. These explorations have demonstrated that the thermal aerosol fog generator unquestionably has promise of unique value in many fields of pest control work and merits careful experimental study by entomologists and plant pathologists. The preliminary report here presented is designed to bring this fact to their attention.

The effect of DDT on cutaneous sensations in man, Y.-C. CHIN and C.-H. T'ANT (*Science*, 103 (1946), No. 2682, p. 654).—The results of tests with 32 student volunteers indicated that oil facilitates the penetration of DDT into the skin. The minimum pressure that would arouse the tactile sensation of the skin in contact with the olive oil solution or vaseline mixture of DDT was 1 to 2.5 gm. per square centimeter higher than the control treated with the diluent only.

The effects of variations in atmospheric pressure upon insects, W. G. WELLINGTON (*Canad. Jour. Res.*, 24 (1946), No. 3, Sect. D, pp. 51–70).—The author presents a review and analysis of the available literature (78 references) on the effects of pressure changes on insects. Variations in atmospheric pressure are classified briefly, but the effects of pressure changes on insects are considered from the standpoint of their reaction to extremely low, extremely high, and slight variations in pressure. It is concluded that extreme changes exert no direct influence on insects; on the other hand, there is evidence that slightly reduced pressure increases the rates of development and of the various activities, while slightly increased pressure has no apparent influence on these processes. A discussion of the possible role of chordotonal organs in the observed responses of some insects to fluctuating pressure is included, and certain laboratory experiments are suggested as possible aids in quantitative determinations of the effects of varying atmospheric pressure on insects.

Concealed phases in the metamorphosis of insects, H. E. HINTON (*Nature [London]*, 157 (1946), No. 3991, pp. 552–553, illus. 1).—The three examples given are believed to show clearly that the conception of certain biological phenomena is fundamentally altered when the instars are defined more accurately than is usually the case. The term “pharate” is proposed to designate the phase of an instar which is enclosed within the cuticle of the previous instar.

Folic acid in the nutrition of certain insects, G. FRAENKEL and M. BLEWETT (*Nature [London]*, 157 (1946), No. 3995, p. 697).—Data presented appear to indicate folic acid to be important in the nutrition of certain test insects (Mediterranean flour moth, yellow mealworm).

Edgegrowth as related to crop yield and insect damage, G. W. UNDERHILL and O. F. BODENSTEIN (*Virginia Sta. Tech. Bul.* 97 (1946), pp. 18, illus. 3).—Studies were carried out in an 80-acre field bounded on one side by oak woods and certain planted edge-growth areas. The rotation practiced was wheat, red clover and timothy, and corn, the clover and timothy having been seeded prior to the first collections of insects. Collections were made at 4- to 6-week intervals from March to September during the summers of 1942, 1943,

and 1944. Variations occurred in the number of insects collected in selected areas for certain periods in the season and even with some families and related groups of injurious species, but the differences were not consistently tied up with the relation of the stations to the woods or border plantings. In studies at selected stations on hay yields, injury to young and mature corn did not show differences that could be credited to insect injury as related to edge growth.

Few insects were noted on the three varieties of lespedeza used in the edge-row plantings and none appeared of much economic importance except two species of *Alydus*. The authors conclude that lespedeza seems to fit in well for a border crop in this field.

Index to "The Grasshoppers and Other Orthoptera of Arizona," L. P. WEHRLE (*Arizona Sta. Mimeog. Rpt. 81 (1946), pp. 8+*).—This is a supplement to Technical Bulletin 93 (E. S. R., 87, p. 827).

Grasshoppers and locusts in Western Australia, C. F. H. JENKINS (*Jour. Dept. Agr. West. Austral., 2. ser., 22 (1945), No. 4, pp. 322-331, illus. 9*).—The small plague grasshopper *Austroicetes cruciata* Sauss.—said to be the most important grasshopper in Western Australia—is discussed in some detail, including a record of outbreaks and methods of control. Other grasshoppers and locusts of importance in the area are taken up more briefly.

Benzene hexachloride in grasshopper baits, S. L. ALLMAN (*Agr. Gaz. N. S. Wales, 57 (1946), No. 4, pp. 171-172, 182, illus. 2*).—Localized outbreaks in New South Wales during 1945 are reported for the wingless grasshopper *Phaulacridium vittatum* and the Australian plague grasshopper *Chortoicetes terminifera*. The tests carried out indicated that "666" (benzene hexachloride)-bran baits were readily eaten by both species, would successfully control the first species in a cabbage crop where gross feeding is necessary to cause losses, and would obviously incapacitate a large proportion of a swarm of the second species within an hour of feeding.

17-year cicada notes for 1945, F. M. SCHOTT (*Jour. N. Y. Ent. Soc., 54 (1946), No. 2, pp. 167-169*).—Notes for the New Jersey and nearby New York area.

Two new Nemocera Diptera (Sciaridae and Cecidomyiidae), W. F. RAPP, JR. (Univ. Ill.). (*Amer. Ent. Soc. Trans., 71 (1945), No. 4, pp. 125-128, illus. 2*).—The two new genera and species—*Niadina jauva* and *Epourenia viva*—are described, and a key to the North American genera of the family Sciaridae is provided.

Life tables for *Musca vicina* and *Calliphora erythrocephala*, B. FELDMAN-MUHSAM and H. V. MUHSAM (*Zool. Soc. London Proc., 115 (1946), pts. 3-4, pp. 296-305, illus. 3*).—Life tables for the imagos of the oriental housefly and the bluebottle fly *C. erythrocephala* Mg. were compiled from specimens kept under controlled conditions; the former were fed on diluted milk and the latter on 10 percent sugar and chicken liver. In *Musca*, the ♀♀ were slightly longer lived than the ♂♂; the reverse was true for the bluebottle fly. The survivorship curves—and more strikingly the death curves—exhibited a relatively high mortality during the early days of imaginal life. For purposes of graduation, the life tables were broken up into two parts and the first—containing the period of "premature imaginal mortality"—fitted by a fifth order parabola and the second by the Gompertz-Makeham formula. For *Musca*, a complete life table—covering all developmental stages—was compiled and compared with the human life table including miscarriages; this revealed a parallelism between portions of the survivorship curves representing respectively the periods of foetus (egg), infancy (larva), youth and puberty (pupa and young imago), and adult man (fertile imago).

A review of the tachinid genera *Siphophyto* and *Coronimya* (Diptera), H. J. REINHARD. (Tex. Expt. Sta.). (*Ent. Soc. Wash. Proc.*, 48 (1946), No. 4, pp. 79-92).—A key to the species and new taxonomy are included.

Undescribed species of crane-flies from the western United States and Canada (Dipt.: Tipulidae), V. C. P. ALEXANDER. (Mass. State Col.). (*Ent. News*, 57 (1946), No. 3, pp. 65-71).—In the present article (E. S. R., 93, p. 739) three new species of *Tipula* are described.

Notes on the occurrence of the Comstock mealybug (*Pseudococcus comstocki* (Kuw.)) at Niagara Falls, Ontario, R. W. SHEPPARD (*Canad. Ent.*, 77 (1945) No. 12, p. 217).

The life-history of *Pachythelia villosella* Ochs. (= *nigricans* Curt.) (Lep.: Psychidae), J. HEATH (*Ent. Mo. Mag.*, 4. ser., 7 (1946), No. 75, pp. 59-63, illus. 8).—Notes are presented on the life history stages and food plants of this bagworm moth in Britain.

Rate of development of milky disease in Japanese beetle populations, J. A. ADAMS and E. H. WHEELER. (N. Y. State Expt. Sta.). (*Jour. Econ. Ent.*, 39 (1946), No. 2, pp. 248-254).—Under the climatic conditions at Poughkeepsie, N. Y., the currently used light dosages of standard milky disease spore dust containing *Bacillus popilliae* applied as soil inoculants against the Japanese beetle are known to be slow to act. Higher dosages, at five rates ranging from 10 to 2,000 lb. to the acre, were applied in April on small field plots and the results observed by frequent soil diggings. A small percentage of diseased larvae was found in all the plots within 1 to 6 mo. after treatment; a satisfactory degree of control, however, was achieved only at the highest dosage after 18 mo. The findings indicate that in southern New York raising the dosage of spore dust from 2 to 2,000 lb. to the acre can reduce the time for satisfactory control from about 4 yr. to about 2 yr. The results support the current practice of using standard spore dust at inoculative dosages wherever eventual and permanent reduction of Japanese beetle populations is sought; they do not hold promise for the use of very heavy applications of spore dust to act as substitutes for chemical soil treatment on restricted areas where immediate control may be imperative.

Japanese beetle attractants with special reference to caproic acid and phenyl ethyl butyrate, G. S. LANGFORD and E. N. CORY. (Univ. Md.). (*Jour. Econ. Ent.*, 39 (1946), No. 2, pp. 245-247).—During the war several modified bait formulas were offered to conserve geraniol and eugenol. In expanded studies the past summer with 100 selected mixtures, 40 combinations were found with distinct attractiveness—10 of them ranging from 2 to 3 times as effective as the geraniol-eugenol standard. Two chemicals—phenyl ethyl butyrate and caproic acid—proved exceedingly promising as ingredients for baits. As to simplicity and economy, caproic acid 8 parts and phenyl and ethyl butyrate and eugenol (50-50) 2 parts proved one of the most efficient and practical combinations tried, 29 replications catching 2.8 times as many beetles as the geraniol-eugenol standard; other chemicals in limited tests gave outstanding and attractive baits when used in various combinations. The relations of the chemicals in the mixture, the ratio in which they are combined, and the influence of evaporation rate on the effectiveness of attractants are discussed briefly. The results of these experiments represent trends and indicate the relative values of different combinations for practical application.

Ligyris burmeisteri, plaga de los cultivos en La Pampa [The beetle *L. burmeisteri* as a pest of cultivated plants in La Pampa, Argentina], J. WILLIAMSON (*Rev. Argentina Agron.*, 13 (1946), No. 1, pp. 56-58).

A new species of Tillus from Arizona (Coleoptera: Cleridae), J. N. KNULL. (Ohio State Univ.). (*Ohio Jour. Sci.*, 46 (1946), No. 2, p. 72).—*T. patagoniae* n. sp. is described.

Diatomaceous diluents for dusts, N. TURNER. (Conn. [New Haven] Expt. Sta. et al.). (*Jour. Econ. Ent.*, 39 (1946), No. 2, pp. 149–158, illus. 7).—Fifteen laboratory samples of diatomaceous diluents for pure ground derris root were studied. Toxicity tests on the bean aphid showed one to be superior to pyrophyllite, two others to approach pyrophyllite, and a fourth to be somewhat less effective but with a steeper dosage-response curve. Attempts to correlate toxicity with derris to the physical data available were unsuccessful, but materials of extremely fine particle size were not the most effective diluents for pure ground derris. Tenacity studies revealed three types of curves, viz, flatter than, parallel with, and steeper than the standard Bancroft clay. Two of the materials of high tenacity proved relatively effective as diluents for derris. Materials for field trials were selected on the basis of their effects on toxicity and tenacity as determined in the above laboratory tests. Field tests with cube on the Mexican bean beetle showed that the materials performed in approximately the same order as in the laboratory, though more in the order of toxicity than of tenacity tests. The more effective materials performed relatively better in comparison with pyrophyllite in the field than in the laboratory. In field tests of cryolite, materials of high tenacity performed well on both beans and cabbage, but less tenacious materials did surprisingly well.

Alfalfa tripping by insects, G. H. VANSELL and F. E. TODD. (Coop. U. S. D. A.). (*Farm and Home Sci. [Utah Sta.]*, 7 (1946), No. 2, pp. 9–10, illus. 4).—Four groups of bees were found doing a satisfactory job of tripping alfalfa in Utah fields, namely, *Megachile*, *Nomia*, *Apis*, and *Bombus*, (leaf-cutter bees, alkali bees, honeybees, and bumblebees). Under continuous observation maximum numbers of blossoms tripped by a single bee under observation were as follows: Leaf cutter bees 158, honeybees 129, and alkali bees 78. Mention is made of the fact that strong hives of honeybees contain 30,000 to 50,000 individuals but it is not known how many in such a population are active workers. The authors point out that without the beneficial insect pollinators the production of alfalfa seed is almost as hopeless as is the production of sweet cherries and almonds.

El pulgón verde de los cereales del Uruguay (Toxoptera (= Schizaphis) graminum Rondani [The greenbug of cereals in Uruguay], A. SILVEIRA GUIDO and E. CONDE JAHN (*Univ. Repub. [Montevideo], Rev. Facult. Agron.*, No. 41 (1945), pp. 35–86, illus. 15).—This is a general review and study of this aphid, involving the history of the pest, descriptions of its stages, geographical distribution, host plants, life cycle, characteristics of its attacks, and control—biological, chemical, physical, and auxiliary measures.

The reaction of barley varieties to wheat stem sawfly attack, C. W. FARSTAD and A. W. PLATT (*Sci. Agr.*, 26 (1946), No. 5, pp. 216–224).—In recent years growers on the open plains of western Canada have been seeding barley early, as opposed to the former practice of late sowing which exposed the crop to attack by the wheat stem sawfly. Field observations indicated that practically no damage was sustained following early seeding of the Prospect and Newal varieties; in all but one report of severe injury, Hannchen was the variety grown, thus indicating the existence of varietal differences. In tests (1944–45) of nine varieties seeded in replicated single-row plots, significant differences in infestation were established in all the nurseries employed and in cutting in all but one, thus agreeing in general with previous field obser-

vations. From the standpoints of both infestation and cutting, there was a tendency for the varieties to fall in the same order: Trebi was most resistant; Plush, Prospect, and Newal were almost equally so; Hannchen and Rex proved most susceptible. None of the barleys sustained damage to the same extent as adjacent plots of Apex, Marquis, or Thatcher wheat. The amount of damage to the barley varieties differed greatly from station to station, indicating that enviroinal factors influence the degree of injury. It is pointed out that even though the economic damage to susceptible barleys is relatively small, such fields provide reservoirs of infestation menacing to nearby wheat. At present the barley acreage in the sawfly area is now seeded almost entirely to resistant varieties; it is suggested that introduction of susceptible varieties be avoided.

Effect of calcic and magnesian diluents of calcium arsenate on bean yields, J. H. HAWKINS. (Maine Expt. Sta.). (*Jour. Econ. Ent.*, 39 (1946), No. 2, pp. 145-148, illus. 5).—An average increase in yield of 19.2 percent was obtained from bean plots by treatment with dusts containing high magnesian hydrated spray lime, monohydrated copper sulfate, and calcium arsenate as compared with untreated check plots. An average increase in yield of 11.1 percent was obtained from plots receiving high magnesian lime and calcium arsenate as compared with the check plots and an increase of 1.2 percent when treated with high calcic lime, monohydrated copper sulfate, and calcium arsenate. There was an average decrease of 21.9 percent in yield of beans from the plots treated with dusts containing high calcic lime and calcium arsenate as compared with bean yield from untreated check plots.

Life history and habits of *Strigoderma arboricola*, J. M. GRAYSON. (Va. Expt. Sta.). (*Jour. Econ. Ent.*, 39 (1946), No. 2, pp. 163-167, illus. 1).—During a 2-yr. study on the economic importance, life history, and habits of *S. arboricola* (F.) in eastern Virginia, surveys of peanut fields at digging time revealed only minor injury to the pods attributable to its grubs or to any other species of grubs. A year was required for a single generation; the winter was passed as a third-instar larva in the soil about 7.7 in. deep. The number of days required for the various life stages during 1944 and 1945, respectively, were, for the egg, 8 to 19 with a mean of 13.6 and 8 to 21 with a mean of 13.4; first-instar larva, 13 to 25 with a mean of 16.2 and 12 to 30 with a mean of 16.6; second-instar larva, 12 to 21 with a mean of 15.1 and 10 to 36 with a mean of 17.5; third-instar larva (1944-45), 238 to 292 with a mean of 257.3; prepupa (1945 only), 5 to 20 with a mean of 11.4; and pupa, 9 to 13 with a mean of 11.9 and 15 to 32 with a mean of 24.9. The mean adult longevity was 17 days for the ♀♀ and 16.7 days for the ♂♂; the mean preoviposition period was 12.5 days, and a mean of 26.3 eggs per ♀ were deposited. Neither adults nor grubs were host-specific. Adults were collected from the blossoms of a number of different plants; grubs, from the soil under all principal agricultural crops grown in the peanut-producing area of Virginia. The dates of adult emergence, egg deposition, and time of entering prepupal and pupal stages are discussed. Measurements of major and minor axes of eggs 1 or 2 days and 12 or 18 days in age are given. The soil and air temperatures occurring during the principal periods of growth are shown graphically.

Summary of results in six States with DDT as a potato insecticide in 1945 (Amer. Potato Jour., 23 (1946), No. 4, pp. 135-150).—In order to assemble the results of research on DDT, various investigators were invited to submit brief summaries of their work; the reports from trials in six States are here included (Conn. [New Haven] Sta., by N. Turner; Nebr. Sta., by R. E. Hill;

N. J. Stas., by J. C. Campbell and B. B. Pepper; Cornell Univ., by W. A. Rawlins; Ohio Sta., by J. P. Slesman and J. D. Wilson; and Pa. State Col., by J. O. Pepper). Although there was a general agreement on the potentialities of DDT for potato insect control, its place in the spray and dust program "will be secured only after further trial at the hands of investigators and potato growers."

Control of aphids on potatoes in northeastern Maine, T. E. BRONSON, F. F. SMITH, and G. W. SIMPSON. (U. S. D. A. coop. Maine Expt. Sta.). (*Jour. Econ. Ent.*, 39 (1946), No. 2, pp. 189-194).—In field tests in northeastern Maine designed to study the effectiveness of various insecticides against aphids on potatoes, when used with fungicides for controlling late blight, DDT applied as an emulsion, an aerosol, a dust mixture, or a suspension proved effective for reducing populations of the buckthorn aphid *Aphis abbreviata* Patch, the green peach aphid, potato aphid, and the foxglove aphid *Myzus pseudosolani* (Theob.) and increasing potato yields. Although there was a tendency for the dust mixture to be more effective than the sprays and the aerosol, greater quantities of DDT per acre were used in the dust mixture and suspension than in the emulsions and aerosol. Tractor-mounted sprayers applying 100 gal. per acre reduced the aphids more satisfactorily than did traction sprayers delivering 65 to 75 gal. per acre. When a four-nozzle sprayer equipped with vine lifters was used, the aphid kill was slightly greater than that obtained with a standard three-nozzle sprayer; use of a concentrated spray applicator resulted in poor control. All DDT treatments were highly effective against the Colorado potato beetle and potato flea beetle. All treated plots remained green much later in the season, owing to flea beetle control as well as to reduction in aphid populations. Viruliferous dispersal forms of winged aphids were attracted to the green treated foliage and resulted in increasing the percentages of leaf roll in harvested tubers. A zinc nicotinyl fluosilicate dust and a nicotine sulfate spray were effective aphicides. A derris spray proved inferior to DDT. A benzene hexachloride dust mixture was very effective against both aphids and flea beetles.

DDT to control potato aphids, G. G. GYRISKO, G. P. WENE, and W. A. RAWLINS. (Cornell Univ.). (*Jour. Econ. Ent.*, 39 (1946), No. 2, pp. 205-208).—The green peach and potato aphids are important pests in New York's potato-producing areas. Field tests during the past season on Long Island and in western New York revealed DDT to be a better aphicide than such standard materials as rotenone, nicotine, and the thiocyanates. Except for nicotine fumigation, DDT reduced populations more than the other insecticides tried. The residual effectiveness of DDT was not as pronounced for the potato aphid as it was for the green peach aphid; populations of the former recovered or built up faster between applications than did the latter, perhaps due to a difference in the portion of the plant infested by the two species. The potato aphid is found chiefly on the rapidly growing terminals; the green peach aphid on the lower levels where it is more likely to be in contact with DDT deposits. In comparisons of several concentrations of dust, spray powder, and emulsifiable solution, aphid control and tuber yield increased with each increment of DDT used. The findings suggest that at least 2 lb. of DDT per acre as spray powder or dust are needed in each application during the infestation period. Frequent treatments are necessary to keep populations at a reasonably low level; this proved more important for the potato aphid than for the green peach aphid.

Susceptibility of Green Mountain and Irish Cobbler commercial strains to stem-end browning, A. F. ROSS. (Maine Expt. Sta.). (*Amer. Potato Jour.*,

23 (1946), No. 6, pp. 219-234, illus. 1).—Different lots of Green Mountain potatoes vary greatly in susceptibility to stem-end browning; these differences were found to be inherited and not due to differences in the way the seed tubers had been handled. The behavior of each lot was consistent from field to field and year to year. The data obtained revealed two degrees of susceptibility in this variety. In general, the susceptible type or strain produced two to seven times as much browning as the more resistant one, depending on environal conditions. Tuber lines selected from either type were no more or no less susceptible than the original unselected lot. Only in the case of those lots which were mixtures of susceptible and resistant strains did tubers showing the trouble produce more stem-end browning when planted than tubers which were normal in appearance selected from the same lot. All Irish 'Cobbler' lots were highly and equally susceptible.

Controlling soybean insects, C. F. SMITH (*Res. and Farming [North Carolina Sta.]*, 4 (1946), *Prog. Rpt. 3*, pp. 7, 9, illus. 1).—In North Carolina the most injurious soybean pests are the velvetbean caterpillar, green clover worm, native bean beetle, Mexican bean beetle, corn earworm, and blister beetles. Native bean beetles and Mexican bean beetles do not often cause damage severe enough to justify treatment; blister beetles may be controlled by poison dusts; while leaf worms and corn earworms may be controlled with dusts of cryolite or combinations of cryolite and DDT.

The influence of cover crops on wireworm injury to tobacco, D. E. GREENWOOD (*Connecticut [New Haven] Sta. Bul. 493* (1946), pp. 14-16).—A discussion is given of the value of a rye winter cover crop for reducing damage by wireworm to potatoes. Although it is not suggested that the wireworms are reduced in numbers, the method has been successful because they finish their early season feeding phase on rye roots and do not feed further on tobacco plants when they are set out.

Seed pitting of the lima bean by *Lygus* bugs in California, K. F. BAKER and W. C. SNYDER. (Univ. Calif.). (*Science*, 103 (1946), No. 2678, pp. 500-501).—According to this preliminary report, the experimental results establish the fact that the toxic feeding of *Lygus* bugs is responsible for a seed spotting and pitting in the California lima bean crop, as well as for some of the dropping of blossoms and pods. It is believed possible that other insects also may be involved.

DDT and other new insecticides for control of cauliflower worms on Long Island, H. C. HUCKETT. (N. Y. State Expt. Sta.). (*Jour. Econ. Ent.*, 39 (1946), No. 2, pp. 184-188).—As applied to cauliflower seedbeds for control of the green peach aphid and the onion thrips, dusts with 2, 1, and less than 1 percent DDT tended to be slightly more effective than a cube dust of 0.5 percent rotenone content; a dust containing 2 percent of the DDT analog DDD was slightly less effective. Sprays containing DDT in solution-emulsion form at 0.025 and 0.0125 percent DDT proved fully as effective as those containing a suspension of cube powder at 0.025 percent rotenone. Nearly comparable results were obtained with a spray containing a suspension of DDT in powder form at 0.05 percent DDT; at greater dilutions, results were less satisfactory.

DDT dusts and sprays were also applied to the fall crop of cauliflower for control of the imported cabbageworm, cabbage looper, and diamondback moth in comparison with treatments containing pyrethrum, cube, sabadilla, and Ryanex powders respectively, as well as with a dust containing DDD. Treatments were given three times during August 8-September 24 at intervals averaging slightly longer than 3 weeks. In these tests DDT dusts

ranging in strength from less than 1 to 3 percent DDT were highly effective; a dust containing 2 percent DDD was slightly less so. The remaining dust mixtures—containing such insecticides as pyrethrum, cube root, sabadilla seed, and Ryanex, were significantly less satisfactory, probably due chiefly to the extended intervals between applications. Despite this handicap, plots dusted with a mixture containing 20 percent sabadilla powder gave evidence of promising results. DDT sprays were also effective for worm control; they consisted of suspensions of a wettable powder containing 25 percent DDT and of mixtures of an oil emulsion possessing 25 percent DDT in solution. Sprays containing 1.5 or 3 lb. of the above powder in 100 gal. water (0.047 and 0.094 percent DDT respectively) and 1 pt. of the emulsion in 100 gal. water (about 0.0312 percent DDT) were slightly more effective than those of lower DDT content. These results are of particular interest locally in that heretofore sprays containing suspensions of pyrethrum or rotenone-containing powders have not been effective for worm control on cauliflower.

Insecticidal aerosols for pea aphid control—second report, L. P. DITMAN, L. D. GOODHUE, F. F. SMITH, and G. BURKHARDT. (Md. Expt. Sta. coop. U. S. D. A.) (*Jour. Econ. Ent.*, 39 (1946), No. 2, pp. 199–204, illus. 1).—In further work (E. S. R., 93, p. 745), aerosols containing 5 percent of DDT in various formulas were applied to about 100 acres of Alaska and wrinkled pea varieties with a dispenser designed for commercial use and mounted on a jeep. Treatments with 0.5 lb. DDT per acre at speeds of 3 to 5 miles per hour were more uniformly effective than higher speeds and lower dosages. Nozzles with an output of 3 gal. per hour were comparable to the previously used 2-gal. per hour nozzles. Successful applications were made during varying weather conditions, including temperatures of 54° to 84° F., wind velocities up to 20 miles per hour, and in both sunshine and rain. Treatments resulted in 97 to 99 percent reduction of the aphids and in yield increases of 10 to 67 percent where infestations were heavy. Better aphid control and greater increases in yield were obtained on Alaska than on wrinkled peas; this may have been due in part to differences in vigor of infestation. Nozzle stoppage due to corrosion particles or formation of crystals was largely corrected by including a methylated naphthalene in the solution, adding 1 percent of propylene oxide to combine with any free acids, and installing a filter in the line.

DDT preparations for control of the pea aphid, L. P. DITMAN. (Md. Expt. Sta., U. S. D. A., et al.). (*Jour. Econ. Ent.*, 39 (1946), No. 2, pp. 219–222).—In the experimental plots and commercial applications here described, dry-mixed DDT dust and suspensions of DDT in water failed to give satisfactory control of the pea aphid. All of the various DDT emulsion sprays tried gave excellent kills, but some formulations caused serious plant injury—attributed to the direct action of the solvent or the emulsifier on the plant and to excessive amounts of one or the other of these ingredients. Emulsions of DDT in xylene, ethylene dichloride, and the aliphatic petroleum oils—in which minimum amounts of solvent and emulsifier were used—were apparently the safest of the treatments on the foliage. In limited phytotoxicity tests, Velsicol AR-60 appeared to be a satisfactory solvent; Triton X-100 was the most satisfactory emulsifier tested. A safe formula for spraying apparently consists of xylene or ethylene dichloride 390 cc., DDT 227 gm., and Triton X-100 20 cc.; this suffices for 1 acre of peas and should be diluted with enough water to make the amount of finished spray being applied per acre. DDT at 0.5 lb. per acre in a water emulsion appears to be ample for pea aphid control, and in tests reported was superior to the proprietary

rotenone emulsion Tubicide at twice its recommended concentration and to the standard spray of ground derris root.

DDT as a control for the pea aphid, H. GLASGOW. (N. Y. State Expt. Sta.). (*Jour. Econ. Ent.*, 39 (1946), No. 2, pp. 195-199, illus. 3).—Though much progress has been made over a 10-yr. period in pea aphid control, the methods and materials now commonly available still leave much to be desired. With this situation in mind, DDT was given a trial during the past season in a number of dust formulations, as well as in concentrated and conventional type sprays. The experience thus far is said to indicate that DDT in either dust or spray form has real possibilities for use against this pest.

An evaluation of various sprays to control immature squash bugs, T. C. WATKINS. (Cornell Univ.). (*Jour. Econ. Ent.*, 39 (1946), No. 2, pp. 255-261, illus. 1).—The results of numerous laboratory tests of 26 sprays against squash bug eggs, 21 against newly hatched nymphs, 10 against nymphs at least 21 days old, and 1 spray against adults are presented; none of the materials gave evidence of real effectiveness as ovicides, but several—notably those containing pyrethrum—gave high kills of young nymphs. On further testing against older nymphs the same materials failed to kill any high percentages of them. Three formulations of DDT sprays were tested, but only the one made from an oil base containing 5 percent DDT proved effective against active stages. It is suggested that for further laboratory or field testing an emulsible oil be used which contains a much greater amount of DDT in order to apply a large enough dosage to kill older nymphs while at the same time reducing the amount of oil to a concentration not injurious to foliage. Two copper fungicides included in the series showed no appreciable toxicity to either eggs or active stages.

Tomato fruitworm control, W. E. PEAY. (Coop. U. S. D. A.). (*Farm and Home Sci. [Utah Sta.]*, 7 (1946), No. 2, pp. 3-4, illus. 3).—An account relating to past work on the tomato fruitworm, habits of this insect, various problems involved in Utah, and a discussion showing how accurate predictions of infestations can aid in control operations. The yellow striped armyworm, which was involved in damage to tomatoes in 1944 and 1945, is also discussed.

Differences in the life history of codling moth, (*Carpocapsa pomonella* (L.)) attacking pear and apple, T. ARMSTRONG (*Canad. Ent.*, 77 (1945) No. 12, pp. 231-233, illus. 1).—In a pear orchard on the Niagara Peninsula more or less isolated from other apples and pears, the codling moth strain present appeared to be mainly single-brooded, the moths emerging from overwintered larvae 2 to 3 weeks later than those from comparable apple orchards, and therefore too late to allow more than a very small second brood. If the majority of the spring-brood adults appeared from mid to late June in the pear as in apple orchards, the larvae hatching from the eggs of these moths would find fruits very difficult to enter. It is believed that over a period of time in the past, a high percentage of the early-appearing larvae were unable to make entry into these hard fruits and consequently perished, later appearing larvae—finding more mature and softer fruits which were more easily entered—being able to survive.

Codling moth control with DDT, G. M. LIST and J. H. NEWTON. (Coop. U. S. D. A.). (*Colo. Farm Bul. [Colorado Sta.]*, 8 (1946), No. 3, pp. 9-12, illus. 1).—Results showed that sprays containing DDT resulted in a smaller percentage of wormy fruit, but must be applied with additional materials if mites are to be controlled. Four different spray programs are suggested.

DDT for codling moth control in western New York in 1945, S. W. HARMAN. (N. Y. State Expt. Sta.). (*Jour. Econ. Ent.*, 39 (1946), No. 2, pp. 208-210).—For the second successive year DDT sprays are reported as superior to lead arsenate for combatting the codling moth in western New York; they have been used with apparent safety on both fruit and foliage. Analyses for spray residue on treated fruit indicate that it should not be difficult to keep within tolerance limitations, even after use of a full schedule of DDT in cover sprays. It is possible that trouble with the European red mite may be encountered in the future, but thus far it has not developed to problem proportions as a result of using DDT sprays.

Use of DDT against codling moth on apples and pears requires caution, A. B. LEMMON (*Blue Anchor*, 23 (1946), No. 2, pp. 22, 23).—Experiments of 1945 indicated DDT to show great promise for codling moth control on pears and apples, but at present there is no known satisfactory method of removing the residue after harvesting. No significant amounts should therefore be applied on varieties destined for sale as fresh fruits; use of DDT should be restricted to early sprays or to fruits intended solely for processing after removal of the skins.

Influence of some spray ingredients and dosage of lead arsenate on effectiveness of lead arsenate sprays for codling moth control, W. S. HOUGH (*Virginia Sta. Bul.* 388 (1946), pp. 11, illus. 3).—Results from evaluating sticklers, spreaders, and adjuvants over a 3-yr. period indicated that some materials increased effectiveness of lead arsenate sprays for codling moth control. Data obtained did not show that correctives increased or decreased efficiency of lead arsenate, excepting that the use of 10 lb. of lime per 100 gal. resulted in increased codling moth damage. Where lime-sulfur was used in sprays containing lead arsenate, percentage of fruits injured by codling moth averaged three times greater. Applications of 2, 3, and 4 lb. of lead arsenate were used from 1943 to 1945, inclusive, to observe the relation of dosage to codling moth control, and the reduction in stings was marked in going from a dosage of 3 to 4 lb. When dosage was reduced from 3 to 2 lb. in 1943 and 1944, 2 years favorable for codling moth, a larger proportion of wormy apples resulted.

DDT and Ryanex to control oriental fruit moth: Their effect upon parasite populations, E. H. WHEELER and A. A. LA PLANTE, JR. (N. Y. State Expt. Sta.). (*Jour. Econ. Ent.*, 39 (1946), No. 2, pp. 211-215, illus. 2).—DDT and Ryanex were compared with each other, with natural parasitism, and with areas where additional parasites were released for controlling the oriental fruit moth in peaches. Their effect on both twig- and fruit-infesting larval populations and on parasite populations were included in the study. Four sprays of DDT at 1 lb. actual toxicant to 100 gal. applied at 3-week intervals greatly reduced the number of twig-infesting larvae and also the rate of parasitism; Ryanex had a comparable effect, but for a shorter period. The DDT provided superior protection to the fruit. Ryanex failed to give the residual action of DDT but should provide protection if used at shorter intervals. No injury to foliage or fruit was observed, but an infestation of red spider mite appeared late in the season in the DDT blocks.

Peachtree borer control in Delaware, P. L. RICE and D. MACCREARY (*Delaware Sta. Bul.* 261 (1946), pp. 21, illus. 3).—During a 3-yr. period the station conducted a study to establish the safety of ethylene dichloride emulsion for peachtree borer control in comparison with paradichlorobenzene and a commercial preparation consisting of paradichlorobenzene dissolved in a miscible oil. Treatments were applied in seven orchards containing three com-

mon peach varieties and to trees 3 yr. old. Surviving borers were counted and observations made on injury from insecticides and increases in trunk diameters of trees. These insecticides did not prove injurious and did not retard tree growth. Paradichlorobenzene gave 88.3 percent control, ethylene dichloride 97.1, and the commercial preparation 94.1 percent. Results confirmed previous findings that ethylene dichloride can be used effectively later in the fall than paradichlorobenzene. The study also indicates that paradichlorobenzene dissolved in oil or other similar formulations are more effective at lower temperatures than paradichlorobenzene.

Some insects that cause cat-facing and dimpling of peaches in Virginia. A. M. WOODSIDE (*Virginia Sta. Bul.* 389 (1946), pp. 15, illus. 17).—Heavy losses in peaches have occurred in Virginia as a result of cat-facing and dimpling of fruits caused by the feeding of insects. Studies showed that *Euschistus tristigmus*, the tarnished plant bug, and the plum curculio are the main causes of cat-facing, while the green stinkbug is largely responsible for dimpling. Insects causing these injuries feed on plants other than peach, and the presence of such hosts usually results in an infestation of the insects on peach. Clean culture, and avoidance of cover crops such as clovers, vetch, and alfalfa, are suggested as possible methods for reducing damage. Soybeans and cowpeas should be discontinued as cover crops when injury occurs. Since the green stinkbug feeds on black locust, elderberry, honeylocust, blackhaw, and wild grape, removal of these from or near orchards is recommended. Plum curculio also damages peaches, but peach growers usually keep this insect in check.

Cat-facing and dimpling in peaches. A. M. WOODSIDE. (Va. Expt. Sta.). (*Jour. Econ. Ent.*, 39 (1946), No. 2, pp. 158–161, illus. 4).—Virginia peach growers have suffered losses from these insect-feeding effects on the fruits. Cat-facing results from attacks of insects when the fruits are small and may be caused by the plum curculio and the tarnished plant bug. Most of it in Virginia orchards seems to be caused by three species of stinkbugs (*Euschistus*); the overwintered adults enter the orchards in April and feed on the young fruits. Dimpling is usually caused by the green stinkbug in midsummer.

Life history studies of *Euschistus servus* and *E. tristigmus*. A. M. WOODSIDE. (Va. Expt. Sta.). (*Jour. Econ. Ent.*, 39 (1946), No. 2, pp. 161–163).—Life histories of the stinkbugs *E. servus* (Say) and *E. tristigmus* (Say) were studied in cages on peach trees and in the insectary; some observations were also made on the life history of *E. variolarius* (Pal. de B.) in the orchard. *E. servus* and *E. tristigmus* produced two generations per year; *E. variolarius* seems to have but one. All three were reared on peach, though it is not an entirely satisfactory host. Many of the bugs were collected from common mullein.

DDT on peaches: Three years' field experiments. B. F. DRIGGERS. (N. J. Expt. Sta.). (*Jour. Econ. Ent.*, 39 (1946), No. 2, pp. 181–183).—Three yr. of orchard spray tests with DDT at the rate of 1 lb. to 100 gal. water on peaches gave a high degree of control of oriental fruit moth larvae attacking the fruit. One application timed to control the late broods of larvae gave effective control on varieties harvested 3 to 6 weeks after treatment. European red mite built up in large numbers following the DDT sprays and caused heavy defoliation in 2 out of the 3 yr.

The grapeleaf skeletonizer in California. H. M. ARMITAGE. (U. S. D. A.). (*Blue Anchor*, 23 (1946), No. 2, pp. 6, 25–32, illus. 1).—The western grape skeletonizer is reported from California, where its spread is said to be gain-

ing momentum each year in both wild and cultivated grapes, along with annual outbreaks of increasing intensity both as to individual properties and to areas. There is strong evidence that it is an introduced species insofar as this State is concerned, and that it is the result of a very recent carry-in by man. The occurrence of the pest is said to be still sufficiently restricted to make its attempted eradication—even though difficult—practical from the physical and economic standpoints. Surveys and preliminary eradication trials have been made. It is believed that eradication could be best accomplished by removal of all wild grapes and abandoned vineyards, combined with a program of attrition on cultivated vines, using annual applications of a poison dust as was tried in 1945 with cryolite 50 at the rate of 25 lb. per acre in June, 15 lb. in July-August, and 15 lb. in September wherever live larvae were still found.

Use of DDT to control the little fire ant, M. R. OSBURN and N. STAHLER. (U. S. D. A.). (*Citrus Indus.*, 27 (1946), No. 6, pp. 3, 7, 11).—This serious pest to citrus grove workers in some sections along the eastern coast of Florida may be controlled by DDT, according to early results of tests so far outstanding as to justify preliminary information concerning its use. A given quantity of technical DDT in fuel oil applied as an emulsion appeared to be more effective than by other methods tried. The preferred formulation consists of 0.25 to 1 lb. technical DDT, 1 gal. fuel oil, and 1.3 fluid oz. glyceryl oleate, plus water to make 100 gal. Other formulations for dusts and sprays which have given satisfactory results are presented. No injury to treated grapefruit trees has been observed.

The European chafer *Amphimallon majalis* and its control in lawns, F. L. GAMBRELL. (N. Y. State Expt. Sta.). (*Jour. Econ. Ent.*, 39 (1946), No. 2, pp. 168-173, illus. 1).—*A. majalis* Raz. was first observed in North America in 1940 and has become established over an area of about 150 sq. miles in western New York; in a rather limited area, serious damage was observed in turf of lawns, golf courses, parks, and cemeteries, as well as to pasture grasses and wheat fields. For the most part, this pest has a 1-yr. life cycle and causes injuries very similar to those of the Japanese beetle and native species of white grubs. Lead arsenate has been applied at rates of from 250 to 1,500 lb. per acre, calcium arsenate at 500, dusting sulfur and micronized sulfur at 1,000, and DDT emulsions and suspensions at 15, 30, 50, and 200 lb. per acre. Dosages of 250 lb. of lead arsenate per acre proved inadequate for grubproofing the turf; 500 lb. per acre afforded commercial protection for 2 to 4 yr., but 1,000 to 1,500 lb. gave excellent protection and lasted for 4 yr. DDT applied to turf as a suspension at the rate of 30 and 50 lb. per acre appeared promising for larval control; in limited tests 30 lb. per acre proved as effective as 500 lb. of lead arsenate. Likewise, DDT effected a much higher percentage of grub reduction within 2 mo. than did 500 lb. of lead arsenate in the first year following application. A DDT spray suspension applied on trees at the rate of 8 oz. in 100 gal. water knocked down and killed adults coming to rest in treated trees for several days after treatment, but was less effective than the same material at 5 lb. in 100 gal. Even at the higher concentration some gravid ♀♀ deposited eggs before dying. The effect of such treatment on grub reduction was not determined.

Crioceris lili Scop. (Col.: Chrysomelidae) in Flintshire, K. J. COGHILL (*Ent. Mo. Mag.*, 4. ser., 7 (1946), No. 75, p. 51).—A brief note on damage by this beetle to *Alstroemeria violacea* and various species of lily in Britain.

Factors in the natural resistance of woods to termite attack, G. N. WOLCOTT. (P. R. Univ. Expt. Sta.). (*U. S. Dept. Agr., Forest Serv., Caribbean For-*

ester, 7 (1946), No. 2, pp. 121-134, 139-149; *Span. abs.*, pp. 139-149).—It is pointed out that woods high in cellulose have a high food value for termites and that those with a high lignin content are avoided. In the species of wood tested the sapwood is more acceptable while heartwood is largely not attacked. Other factors in wood such as catechin, hematoxylin, fustic, morin, saponin, etc., may retard or prevent termite attack. Wood of many tropical trees, a few semitropical trees, and Osage-orange and southern cypress of the temperate zone are resistant to attack by termites. Natural resistance in coniferous woods is apparently due to their natural impregnation with specific resinous gums.

Roach powder: DDT formula improved by the addition of "Lethane A-70" to improve knockdown—a discussion of combination roach powders, R. B. SCHWITZGEBEL (*Soap and Sanit. Chem.*, 22 (1946), No. 5, pp. 131-133, *illus.* 1).

DDT thermal aerosol fogs to control clothes moths in a wool storage warehouse, D. L. COLLINS and R. D. GLASGOW (*Jour. Econ. Ent.*, 39 (1946), No. 2, pp. 241-245, *illus.* 2).—From experimental tests in a five-floor warehouse containing raw wool, it appears that an insecticidal aerosol fog may have special advantages indoors for some types of insect control work; the aerosol fog seems less subject to loss of concentration through leakage than in fumigations with a gaseous insecticide. Since all the DDT-bearing thermal fogs used in these tests killed practically all of the adult moths in a heavy warehouse infestation, nothing is left on which to base comparisons or an appraisal of the value of added pyrethrins. Not only were the adult moths virtually all killed by the DDT aerosol fog, but even the little DDT that was used appeared to have left residual deposits which killed at least some of the subsequently emerging moths, as well as some of the surviving larvae. Moths and larvae exposed in cages were also killed. The possibility that this technic may provide a much more economical control than any of the older warehouse methods is deemed very promising; use of the method in food storage warehouses would, however, be quite inadvisable. Smallness of particle size is apparently an important factor in governing the persistence and searching properties of these fogs indoors. Plans for following up these preliminary results are under way.

Experiments with DDT in filter fly control, W. C. BROTHERS (*Sewage Works Jour.*, 18 (1946), No. 2, pp. 181-207, *illus.* 6).—This paper is an attempt to contribute from an entomological standpoint to the knowledge of those members of the insect family Psychodidae which are involved in the processes occurring in a sewage trickling filter. Matters considered are the properties of DDT, characteristics of filter flies, the experimental criteria followed, larval control experiments on selected filter areas and those involving an entire filter area, and adult fly control by sprayed residues on resting surfaces, the results of which are taken up in great detail. Effective control was obtained when a DDT dosage of 0.5 p. p. m. was applied in a batch dose and the sewage flow so diverted as to allow the DDT to trickle slowly through the filter for 30 min. Larval reductions of 95.4 and 44.3 percent were obtained in the two tests, with an 80 percent over-all decrease at a depth of 2 ft. in the filter bed. Within 20 min. after treatment a very substantial initial kill had been obtained on both adults and larvae of *Psychoda alternata* Say and *Telmatoctopus albipunctatus* (Will.). This dosage with its 30-min. contact period gave effective larval control for about 30 days, and resulted in such reduction of the adult flies as to warrant consideration as an adequate control measure. A general discussion of the findings and suggestions on preparing and applying the DDT emulsion are presented.

Control of trickling filter flies with DDT, J. A. CAROLLO (*Sewage Works Jour.*, 18 (1946), No. 2, pp. 208-211).—DDT applied at the rate of 0.2 lb. per acre under laboratory conditions was found to kill adult psychodid flies; at 1 to 5 p. p. m. it killed the larvae; but at 30 lb. per acre over the surface of a sewage trickling filter it did not materially reduce the psychodid larval population. DDT applied as a Triton-xylene emulsion to the influent of a trickling filter controlled the larvae and therefore the adults also. The successful amount based on the total 24-hr. flow was 1 p. p. m., but the concentration applied was actually greater at the beginning of each dosing cycle.

Acarianos infestadores de culturas de cogumelos: Biologia, classificação, métodos de combate [Mites infesting fungus cultures: Biology, classification, and methods of control], A. E. AREA LEO, M. T. DE MELLO, and V. MAYOR (*Mem. Inst. Oswaldo Cruz*, 42 (1945), No. 3, pp. 559-608, illus. 16; *Eng. abs.*, pp. 604-605).—The characteristics of mite-infested cultures are described in detail. The study included the morphology, development, and habits of the mites found infesting the culture collections of the Instituto Oswaldo Cruz—tentatively assigned to *Tyroglyphus longior* and *Tarsonemus floricolus*. As a result of tests with various chemicals, the authors recommend the use of kerosene either to kill the mites or to prevent new infestations; it should be dropped on the cotton plugs of the culture tubes and applied abundantly to supports, tables, cupboards, etc., and petri dishes should be placed on filter paper soaked in kerosene. The review of the literature involves 31 references.

La vegetación acuática y la cría de los mosquitos [Aquatic vegetation and the breeding of mosquitoes], R. MARGALEF LOPEZ (*Euclides*, 5 (1945), No. 51-52, pp. 313-319, illus. 1).

The larva and male of *Aedes* (Skusea) *amcsii* (Ludlow) (Diptera: Culicidae), H. HOOGSTRAAL and R. W. CHAMBERLAIN (*Ent. Soc. Wash. Proc.*, 48 (1946), No. 5, pp. 125-131, illus. 2).—Descriptions and illustrations of the ♂ and the larva of this oriental mosquito are presented, along with the synonymy and other pertinent notes.

Three new species of *Aedes* from Netherlands New Guinea, W. V. KING and H. HOOGSTRAAL (*Ent. Soc. Wash. Proc.*, 48 (1946), No. 4, pp. 95-106, illus. 3).—All of these new species of mosquitoes are believed to be uncommon in the area.

Studies in laboratory rearing of *Anopheles quadrimaculatus* Say, R. L. PEFFLY, R. H. DAVIDSON, and H. A. WATERS. (Ohio State Univ.). (*Ohio Jour. Sci.*, 46 (1946), No. 2, pp. 65-70, illus. 2).—Since a constant supply of healthy vigorous adult mosquitoes was needed in various studies of insect repellents, laboratory rearing was initiated; no difficulty was encountered with the yellow fever mosquito, but the rearing of the common malaria mosquito gave considerable trouble. This paper presents several modifications in previous technics which have resulted in greater success.

The punctulatus complex of *Anopheles* (Diptera: Culicidae), L. E. ROZEBOOM and K. L. KNIGHT (*Jour. Parasitol.*, 32 (1946), No. 2, pp. 95-131, illus. 44).—Morphological studies were made of the larvae, pupae, and adult ♀♀ of *A. punctulatus* Dönitz, *A. koliensis* Owen, and *A. farauti* Lav. from the New Hebrides, Solomon Islands, Dutch New Guinea, and the Moluccas. The material consisted of larval, pupal, and adult specimens collected as larvae from natural breeding places and of laboratory-reared progeny from individual ♀♀. The detailed results are presented.

On the adult bionomics of some Indian anophelines, with special reference to malaria control by pyrethrum-spraying, R. SENIOR WHITE, A. R. GHOSH, and V. V. RAO (*Jour. Malaria Inst. India*, 6 (1945), No. 2, pp. 129-215, illus.

§).—The Indian literature (46 references) on the spray-killing of adult mosquitoes with pyrethrum insecticides is reviewed; published results indicate that spraying has been much more successful where *Anopheles culicifacies* was the malaria vector than where it was *A. minimus*. The latter was found to take up to 24 hr. longer to complete the gonotrophic cycle than *A. fluviatilis*. Infection rates as found in earlier work are retabulated, and the anthropophilic indexes of 1,832 specimens of 6 species—as found in houses, cattle sheds, and empty shelters—are set forth and discussed. Experiments with stained specimens are described, and a fallacy liable to occur with dry powder stains is discussed; some data on longevity arising from these experiments are also given. There was a very high percentage of survival for over 12 days in cold weather for *A. fluviatilis*, *A. minimus*, and *A. jeyporiensis*. The composition of the population of 8 species, their numbers, and wing and abdominal stage percentages as found in buildings of various constructions—with and without the attraction of blood—are discussed.

The findings indicate that while *A. culicifacies* remains in human dwellings after feeding and until digestion is nearly complete, the vectors of the *A. fluviatilis* group leave the feeding point when the cycle is only half completed and are thus vulnerable to spray-killing for only one daylight period in each cycle. The monthly proportions of the annual total production in 8 species are tabulated, and the validity of the deductions as to age—drawn from wing state—is shown to be very doubtful. A method of moving averages to bring out true fluctuations in numbers is applied to 3 species, and the results are discussed. Data on night catches in sprayed and unsprayed rooms are presented: In *A. fluviatilis* the entrance was highest after midnight, strongly suggesting that the spraying causes a repellence to entering rooms and so is a useful effect. Experiments with a mosquito trap confirmed the entrance-repellent effect of pyrethrum spraying. Pyrethrum is shown to have different degrees of effect on the numbers of various species, the *A. funestus* series being the most affected; against the *A. fluviatilis* group, the 6 days-a-week spraying is shown to be the most effective, where economically feasible. It was found that in *A. fluviatilis* and *A. varuna* there are definite biological differences between house and outside populations, both in respect to their infection rates and their anthropophilic indexes; *A. varuna* exhibited such extreme differences as to furnish evidence contributory to the previously enunciated hypothesis that this name covers more than one species or biological race.

On the bionomics of *Anopheles culicifacies* Giles, III, IV, R. PAL (*Jour. Malaria Inst. India*, 6 (1945), No. 2, pp. 217–241, illus. 10).—The following parts are included (E. S. R., 91, p. 58):

III. *The behaviour of adults* (pp. 217–238).—The density of this species of mosquito—prevalent in Delhi throughout the year—was found highest during spring and the hot humid July–September period. The correlation between seasonal prevalence and meteorological and breeding conditions is discussed. The density per man-hour was 3.4 during normal years and 25 during a regional epidemic; a density of about 5.4 per man-hour appeared to be the limit below which transmission of malaria by this species does not occur. Temperatures of 25° to 30° C. combined with relative humidities of 60 to 80 percent seemed to be the most favorable climatic conditions for longevity and activity of the species. There was no evidence of true hibernation of the adult, but in those regions of India where the winter is comparatively mild it has been found to hibernate as fourth stage larvae; the species apparently has no summer period of aestivation. The most favored daytime resting

places were inside dark houses and cattle sheds. *A. culicifacies* is not a habitual feeder on man, attacking indifferently man and cattle, depending on a number of factors. Precipitin tests during an epidemic showed a higher percentage of human-fed specimens; the maxillary index proved to be the same in both epidemic and nonepidemic years. Biting activity gradually decreased after midnight. After oviposition in summer the ♀ was observed to return for a second blood feeding the same night. Night collections and marking tests indicated a considerable daily turn-over of the population in houses. At dusk there appeared to be a strong attraction toward light, and most of the individuals left the houses at this time; they failed to return to the same resting place for a blood feeding after oviposition. *A. culicifacies* does not ordinarily fly more than 0.5 mile from its breeding place; it may, however, travel long distances, especially where there is no barrier on its path.

IV. *Hypothesis of the races of A. culicifacies* (pp. 239-241).—Intensive morphological studies on eggs, larval chaetotaxy, adult polytaxy, wing measurements, and ♂ genitalia of this mosquito from various parts of India revealed no difference indicative of the existence of separate races.

The behaviour of *Anopheles fluviatilis*.—IV, Experiments on the behaviour of gravid females, D. K. VISWANATHAN, T. R. RAO, and T. S. RAMA RAO (*Jour. Malaria Inst. India*, 6 (1945), No. 2, pp. 243-245).—Of 285 fully dusted gravid ♀♀ released in a hut or tent on four occasions, 15 were found to return for blood after oviposition within a few hours following release and 2 the next night. The effect of this behavior on a rational spacing of spray-killing is discussed. This must be designed to destroy broods of 48-hr. and 72-hr. feeding cycles conjointly to insure satisfactory results, irrespective of the season of year. Spraying for 2 consecutive days separated by 1 and 2 free days alternately is recommended where impossible to combine antiadult with antilarval measures.

Estudo sobre *Flebotomus* no Vale Amazonico.—Parte III, Descrição de *F. servulolimai* e *F. wilsoni* (Diptera: Psychodidae). Parte IV, Descrição de *F. cerqueirai*, *F. dreisbachi*, *F. meirai*, e *F. ferreirai* (Diptera: Psychodidae), O. R. CAUSEY and R. G. DAMASCENO (*Mem. Inst. Oswaldo Cruz*, 42 (1945), No. 3, pp. 635-660, illus. 34).—In these two installments (E. S. R., 93, p. 739) six new species of blood-sucking flies of the genus *Phlebotomus* are described.

Les glossines de l'Afrique Occidentale Française [The Glossinas of French East Africa], H. GASCHEN (*Basel, Switz.: Verlag für Recht und Gesell.*, 1945, pp. 131+, illus. 115).—A monograph on the species of *Glossina*—the tsetse fly group, so important as vectors of pathogenic organisms to man and animals—in this African region.

A new genus and species of chigger, *Chatia setosa* (Trombiculidae: Acarina) from northwestern United States, J. M. BRENNAN (*Jour. Parasitol.*, 32 (1946), No. 2, pp. 132-135, illus. 7).—*C. setosa* n. gen. and sp. is described and illustrated.

Tick collections at Army installations in the Fourth Service Command, S. J. CARPENTER, R. W. CHAMBERLAIN, and L. PEEPLES (*Ent. News*, 57 (1946), No. 3, pp. 71-76).—Collections of ticks in this seven-State area (Ala., Fla., Ga., Miss., Tenn., and N. and S. Car.) are summarized in an annotated list of species of *Amblyomma*, *Dermacentor*, *Haemaphysalis*, *Ixodes*, *Rhipicephalus*, and *Ornithodoros*; 3,227 specimens representing 47 localities are included.

Control of *Boophilus australis* in the Argentine by the gamma isomer of hexachlorocyclohexane ("Gammexane"), C. N. AULT (*Nature [London]*, 157

(1946), No. 3995, pp. 699-700).—Recent trials are said to indicate that this cattle tick can be controlled by dips containing Gammexane; no adverse effects on the test animals were observed.

Control of the American dog tick, a vector of Rocky Mountain spotted fever—preliminary tests, R. D. GLASGOW and D. L. COLLINS (*Jour. Econ. Ent.*, 39 (1946), No. 2, pp. 235-240, *illus.* 2).—In this emergency work (1945) in a Long Island, N. Y., locality where spotted fever had been dangerously prevalent, screening tests were first made to find the acaricides which had most promise for early large-scale experimental use in the field; this narrowed down the list of most promising materials to DDT alone, Gammexane alone, pyrethrins alone, DDT plus pyrethrins, Gammexane plus pyrethrins, DDT plus nicotine, and Gammexane plus nicotine, each of which have now been given preliminary testing under field conditions. A No. 2 fuel oil solution containing as little as 0.250 percent DDT plus 0.0625 percent pyrethrins, used at a rate equivalent to 2 qt. per acre (but diluted with additional fuel oil to become equivalent to 8 qt. per acre of 0.0625 percent DDT plus 0.0156 percent pyrethrins), appeared under the experimental conditions to be enough to assure practical control; even half of these percentages used at the same rate per acre gave a surprisingly complete kill. In this preliminary work, a general orientation of the problem has been made—apparently sufficient to justify tentative plans for rather large-scale control experiments using DDT alone and in combination with pyrethrins, and possibly also with nicotine and with rotenone; if Gammexane should become available for large-scale tests, it also should be included. In the case of spotted fever, the persistence of the causal agent through the egg stage of the tick vector appears to render long continued use of even the most effective tick control measures necessary if the disease is to be thoroughly rooted out.

Use of D. D. T. against sheep ticks, *Ixodes ricinus* L., G. B. S. HEATH, J. G. MITCHELL, and K. L. BLAXTER (*Vet. Jour.*, 102 (1946), No. 5, pp. 130-140, *illus.* 2).—Of 27 trials of 12 emulsions containing DDT as antitick sheep dips at 0.1 and 2 percent, 15 were classed as excellent or good as compared with a commercial dip; the remaining 12 were classed as fair, poor, or nil in protection. Though DDT may prove a valuable aid in tick control, the results were too variable to allow specific recommendations based on the findings. Physical and chemical data gave no clear indication as to the cause of the irregular results, but a high deposition of DDT in the fleece appears to be associated with good protection. Day-to-day observations of individual ticks on DDT-dipped sheep showed that the majority were unable to engorge; this may account for some of the apparent discrepancies in results. An appendix, presenting a Statistical Note on Tick Control Experiments, by K. L. Blaxter (pp. 137-140), is included.

***Atricholaelaps sigmodoni*, a new species of mite parasitic on the cotton rat, and notes on the genera *Atricholaelaps* and *Ischnolaelaps* (Acarina: Laelapidae),** R. W. STRANDTMANN (*Jour. Parasitol.*, 32 (1946), No. 2, pp. 164-169, *illus.* 7).

The performance of the queen bee, W. C. ROBERTS. (Univ. Wis. coop. U. S. D. A.). (*Amer. Bee Jour.*, [86] (1946), [No. 5], pp. 185-186, 211, *illus.* 1).—The performance of queen bees can be improved by genetic and enviroinal means. Improper rearing produces inferior queens. Experiments with 63 artificially inseminated sister queens in 5 different groups indicated their performance to be equal to that of their naturally mated sisters. There was some variability within groups, but striking differences between groups were observed. Artificial insemination and improved queen-rearing methods are points to be stressed in the development of superior strains of bees.

Save those bees, G. M. LIST (*Colo. Farm Bul.* [Colorado Sta.], 8 (1946), No. 3, p. 3).—A practical account.

DDT as a threat to bees, T. B. MITCHELL (*Res. and Farming* [North Carolina Sta.], 4 (1946), *Prog. Rpt.* 3, pp. 1, 2, 11).—DDT is discussed from the viewpoint of its influence on beneficial insects, including parasites, predators, scavengers, wild bees, and the honeybees. The author points out that there are several unknowns relating to this entire question and that growing crops must be protected, but that these other factors must be considered in due time.

The mode of toxic action of dinitro compounds on the honeybee, G. J. GOBLE and R. L. PATTON. (Cornell Univ.). (*Jour. Econ. Ent.*, 39 (1946), No. 2, pp. 177-180, illus. 4).—The facts brought to light by these studies are summarized as follows: Dinitro salts (sodium salt of 3,5-dinitro-*o*-cresol and sodium salt of 2,4-dinitro-*o*-cyclohexylphenol) are very highly toxic to honeybees; the dinitro compounds do not decompose but remain potentially toxic for some time after application; there is a varietal difference in the attractiveness of sprayed blossoms to bees; the median lethal dose for the sodium salt of 3,5-dinitro-*o*-cresol is 0.0021 mg. per bee; doses as small as 0.00004 mg. of the sodium salt of 3,5-dinitro-*o*-cresol have a measurable effect on the adult bee; and the toxic effect of these compounds is faster at lower temperatures.

Sulfathiazole as a medication for American foul brood disease of honeybees, J. P. JOHNSON and R. STADEL. (Conn. [New Haven] Expt. Sta.). (*Jour. Econ. Ent.*, 39 (1946), No. 2, pp. 141-144).—All colonies treated at the rate of 0.5 gm. to 1 gal. of mixture—regardless of the method used—reacted to some degree favorably, although the chemical in water was not consumed in amounts sufficient to eliminate the disease entirely in one season. When the same proportion was added to equal parts of sugar and water, the mixture proved more attractive to the bees, resulting in a higher consumption and elimination of the disease in less than one season. When used as a medication, sulfathiazole was deposited in the honey and the amount so deposited increased with the amount of the mixtures consumed; since the quantity found in the few samples analyzed amounted to only 20 p. p. m. (9.07 mg. to 1 lb. of honey), and since the treatment in man is in grams per day, a large factor of safety exists. Fall treatments after the surplus honey is removed and spring treatments before surplus honey is being made are considered desirable, especially if the disease can thus be eliminated. Since the paper reports only a single season's work, however, beekeepers should confine their efforts at present strictly to an experimental basis until definite recommendations are made to them by State or Federal authorities, and all honey produced by treated colonies should be kept out of commercial channels until tolerances are established.

An experimental report on the treatment of American foulbrood with sulfa, G. H. CALE and E. KIRLIN (*Amer. Bee Jour.*, [86] (1946), [No. 5], pp. 195-196).—Promising results are reported.

Bakelite varnish for extracting equipment, W. R. ROBBINS. (N. J. Expt. Stas.). (*Amer. Bee Jour.*, 86 (1946), No. 6, p. 236).—The successful experience of the author with this material and the lack of any apparent disadvantages to date lead him to consider it worthy of trial by those wishing to protect their honey against metallic corrosion. It has proved satisfactory in protecting metal surfaces from distilled water for storage tanks where only a fraction of 1 p. p. m. would be objectionable.

ANIMAL PRODUCTION

Estimation of apparent digestibility coefficients by means of an inert "reference-substance," C. R. BARNICOAT (*New Zeal. Jour. Sci. and Technol.*, 27 (1945), No. 2, Sect. A, pp. 202-212, illus. 3).—A method is described for estimating the digestibility of feeding stuffs by feeding with the ration a known proportion of an insoluble and unabsorbable substance, (chromic acid) and estimating the ratio of nutrients to Cr_2O_3 excreted, thereby avoiding the quantitative collection of excreta. The digestibility percentages found were uniformly low due to incomplete elimination of Cr_2O_3 during the collection period. By applying an empirical correction to the calculation, however, results close to the standard method were obtained, particularly with fixed diets.

A new instrument for measuring animals: Standardization of measurements of cattle, T. M. OLBRYCHT (*Empire Jour. Expt. Agr.*, 13 (1945), No. 52, pp. 199-202, illus. 5).—A metal zoometrical rule designed by the author to measure both large and small animals is described, and an attempt at standardization of measurements is made by listing those for cattle "in the order which is most convenient, speedy, and least disturbing to the animal."

Adaptability of cattle to tropical and subtropical climates, R. W. PHILLIPS. (U. S. D. A.). (*Cattleman*, 33 (1946), No. 1, pp. 16-17, 29, 32, 36-37, illus. 6).—The facts summarized "indicate that cattle of different types react differently to the hot environments of tropical and subtropical areas. These differences may be seen in the immediate response of animals to high temperatures as indicated by increased respiration rates, higher body temperatures, and their grazing habits, and by long-term responses which may be measured in terms of economically important characters such as level of milk production in dairy animals and rate of growth in beef animals. The available data indicate that zebu cattle are better able to maintain a normal body temperature than European cattle when atmospheric temperatures are high, and that some zebu blood is desirable in the subtropical region adjacent to the Gulf of Mexico.

"Careful review of the available data reveals that we do not yet have enough experimental evidence to determine the amount of zebu blood that will be most desirable in the Gulf coast area. It may vary in different portions of the area, depending upon the type of forage available, whether or not calves are sold from the cows for slaughter or for use as feeders, and perhaps other factors. There is also a paucity of clear experimental information on how best to use hybrid animals in further breeding operations. Should new types be established, and if so, at what level of zebu blood? Or should a continuous system of crisscrossing be used, in which generations of females are mated alternately to zebu and Hereford (or Shorthorn or Angus or some other breed) bulls? These are questions that need careful attention by cattle breeders and experiment stations if the utilization of stock having zebu blood is to be carried out most effectively."

The beef cattle industry in the Gulf Coast States, L. G. SMITH (*Cattleman*, 33 (1946), No. 1, pp. 18-28, illus. 3).—The history of the industry in this region is briefly depicted.

Maximum utilization of roughage and pasture by steers, G. A. BRANAMAN and C. M. HARRISON (*Michigan Sta. Quart. Bul.*, 28 (1946), No. 4, pp. 344-353, illus. 2).—Continuing an earlier study of the wintering phase (E. S. R. 94, p. 511), the animals there fed were used in a study of pasture management and fattening rations. The calves gaining about 1.6 lb. daily during

the winter made cheaper gains than calves fed similar feeds in amounts to produce 0.9 lb. daily. There was a difference in weight of approximately 100 lb. in May. Calves fed liberally on corn silage produced cheaper gains than those fed hay and corn to make similar gain. The calves gaining faster during the winter were ready for market sooner than the lighter and thinner calves, and they tended to make more total gain for the corn eaten. They showed a greater money return above cost of calf and feed than the corresponding lots of lighter calves. Grazing without grain cut the costs considerably for cattle of both weights. The lighter and thinner calves made considerably faster gains on pasture alone than did those wintered on better rations. Faster gains on pasture alone were made the first 60 days, or during June and July, than during the next 48 days. The lighter calves did not overtake the heavier calves in either weight or finish in 108 days of pasturing.

Feed cost for gains during fattening varied from \$12.59 to \$16.74. The calves grazed 108 days without grain, and those in the well-wintered lot especially, were highest in costs. Lowest cost was for the well-wintered calves grazed 60 days before grain feeding. The most profitable group of calves were well-wintered, grazed 60 days, and fed corn and soybean meal 94 days. They dressed 59 percent and showed a return of \$26.70 above cost of feeder calf and feed. Other lots ranked as follows: Well-wintered and grazed 108 days, \$22.67; lightly wintered and grazed 108 days, \$19.60; lightly wintered and grazed 60 days, \$18.62; well-wintered and grain-fed with pasture, \$16.46; light-wintered and grain-fed with pasture, \$11.87.

Dehydrated potatoes and alfalfa silage for fattening steers, W. E. CONNELL, L. E. WASHBURN, and S. S. WHEELER (*Colo. Farm Bul. [Colorado Sta.], 8 (1946), No. 3, pp. 6-8*).—Lots of 10 or 11 steers fed for 146 days made average daily gains per head of 2.67 lb. on a mixed ration containing 7.22 lb. of alfalfa hay and no silage; 2.57 lb. on a corresponding ration with 4.59 lb. alfalfa hay and 6.04 lb. of alfalfa silage; 2.47 lb. with 4.39 lb. alfalfa hay and 6.13 lb. alfalfa-corn silage; 2.63 lb. with 5.37 lb. alfalfa hay and 6.04 lb. alfalfa silage preserved with phosphoric acid; and 2.57 lb. with 4.85 lb. alfalfa hay and 6.01 lb. corn silage. On terms of feed replacement value, the silages fed averaged about one-fifth the value, pound for pound, of alfalfa hay. Slaughter data revealed that the steers receiving alfalfa-acid silage produced the highest ranking carcasses, yielding 63.1 percent, compared with 62.5 percent for the other two alfalfa silages and 62.2 percent for corn silage. A similar lot of 10 steers fed the same mixed ration as above but with 7.77 lb. of dehydrated potato cubes and no alfalfa hay made an average daily gain of 2.54 lb. per head. These cubes were deemed "equal to ground corn in feeding value when fed with dried beet pulp to fattening steers."

Rations for fattening cattle in Arizona, E. B. STANLEY (*Arizona Sta. Bul. 198 (1945), pp. 16*).—In the abstract of this publication previously printed (E. S. R., 95, pp. 90-91), the words "with wheat" in the first line on page 91 should be omitted.

Cobalt as a preventive of "pining" in Cornwall and Devon, J. B. E. PATTERSON (*Nature [London], 157 (1946), No. 3991, p. 555*).—Experiments in these areas are noted in which significant gains in sheep followed the feeding of cobalt.

Swine pastures save feed and increase profit, W. N. McMILLEN (*Michigan Sta. Quart. Bul., 28 (1946), No. 4, pp. 333-337, illus. 2*).—In a comparison of limited feeding on pasture and feeding on a concrete floor, the average daily gains per head for 4 lots of 12 pigs each for feeding periods of 92 to 107 days were 1.49 lb. when fed ground corn supplemented with meat scrap and soy-

bean oil meal 1 : 1 and minerals on rape pasture; 1.35 and 1.4 lb. on rape pasture when the corn was limited to 80 and 60 percent of that in lot 1 for several weeks; and 1.33 lb. with the same ration as lot 1 plus 5 percent of alfalfa meal and fed on a concrete floor. The respective amounts of feed per 100 lb. gain were 391, 421, 389, and 460 lb. Results with brood sows and fall pigs on rye pasture are also briefly noted.

Cull peas for fattening hogs in dry lot, W. P. LEHRER, JR., and C. W. HODGSON (*Idaho Sta. Cir. 107 (1946), pp. [41]*).—In an 84-day test with four lots of purebred Duroc and Poland China feeder pigs, using a basal grain mixture of rolled wheat, ground cull peas, and ground alfalfa either 75 : 20 : 5 or 60 : 35 : 5 and a mineral mixture of oystershell, steamed bone meal, and salt 40 : 40 : 20, the lot consuming 7.14 percent of meat meal as a protein supplement made an average daily gain of 1.60 lb. per head at a net return per head of \$3.85. Lots receiving 6.56 percent of ground cull peas, 7.49 percent of meat meal, and 6 percent of ground peas made corresponding daily gains of 1.35, 1.68, and 1.54 lb., respectively, with net returns of \$2.44, \$4.85, and \$4.70. The hogs on the ration containing 35 percent peas made faster gains and required less feed per 100 lb. of gain than similar hogs on the ration containing only 20 percent peas. Meat meal was considerably more efficient than ground peas as a protein supplement for the grain ration containing only 20 percent of peas, but only slightly more efficient in supplementing the grain ration containing 35 percent peas.

"Cull peas may be used to advantage in replacing part of the grain ration, thus making larger quantities of wheat available for human consumption. They may also be used to stretch our protein supplements during the present shortage of animal proteins."

The story of Durocs, the truly American breed of swine, B. R. and G. G. EVANS (*Peoria, Ill.: United Duroc Rec. Assoc., 1946, pp. 558+, about 270 illus.*).

Poultry lighting for egg production, J. B. DOBIE, J. S. CARVER, and J. ROBERTS (*Washington Sta. Bul. 471 (1946), pp. 27, illus. (15)*).—This experiment was designed to determine the effect of artificial lights on poultry egg production. Studies included tests of the optimum amount of light to be provided, both as to intensity and length of day; the proper time of day at which the light should be supplied; the best kind of light; and combinations of these various problems. The birds used were carefully selected White Wyandotte pullets that had begun to lay, 20 birds being placed in each battery-type pen in individual cages. There was also a test on a commercial basis, using 288 New Hampshire pullets housed in a commercial laying house.

The results as a whole indicated that the time at which artificial light is given is not important provided a total of 13 hr. of Mazda incandescent light per day is supplied. Any decrease from 13 hr. resulted in decreased egg production, and any increase above 13 hr. did not result in enough increase in egg production to warrant recommendation.

Provided the 13 hr. was received, there was no significant difference on egg production in the effect of intensities of Mazda incandescent light varying from 1 to 31.3 foot-candles, or in the effect of Mazda, Mazda plus CX ultra-violet, ruby red, and red fluorescent light on egg production. Eight hr. of ruby red or red fluorescent light was insufficient to maintain high production.

Keeping the laying house full, J. A. DAVIDSON, C. M. MCCRARY, and C. G. CARD (*Michigan Sta. Quart. Bul., 28 (1946), No. 4, pp. 281-286*).—Continuing work previously noted (*E. S. R., 91, p. 327*), 252 October-hatched White Leghorn pullets averaged at 14 weeks of age 2.36 lb. in weight and a total

feed consumption of 16.5 lb. per bird. From March 1 to September 30 their average egg production was 101.7, which is deemed reasonably satisfactory, although somewhat lower for the same period when compared with birds hatched during the spring months. "It is evident that 'off-season' pullets can be successfully reared and will produce reasonably well. This makes possible more efficient utilization of labor, equipment, and the laying house. The problem of intestinal parasites is less, and the problem of respiratory diseases was not encountered. . . . More work should be done on the best schedule and feeding practice."

Feeding and management of birds in laying cages, L. N. BERRY (*New Mexico Sta. Bul. 328 (1946)*, pp. 11, illus. 5).—In an extension of the study previously noted (*E. S. R.*, 85, p. 390), a feeding test was made with 2 cages of 96 hens each to ascertain the value of dried buttermilk v. soybean oil meal in the ration. In each of the 3 yr. the cage receiving 4 percent of dried buttermilk had a higher average egg production per bird, but the average income per bird per year was only 9 ct., a difference of only 2 percent.

Single-Comb White Leghorns, Rhode Island Reds, and a cross between these two breeds were used in the cages. The crossbred birds gave the highest egg production, averaging 26.8 eggs per bird per year more than the purebred White Leghorns. The crossbred birds were well adapted to the cage system of management, giving decidedly better results in cages than in floor pens under average conditions of care and management, largely because the cages practically eliminated broodiness.

During the 10 yr. that White Leghorns have been kept in cages, they laid more eggs each year than the birds in floor pens. However, the data indicate that this difference in production resulted largely from the fact that the environment of the caged birds was the more favorable.

Laying cages helped to prevent molt in early hatched birds. In these tests pullets which began laying about the middle of July were carried through a 12-mo. laying period with almost no molt.

More caged eggs were produced in laying cages than in floor pens, but "this problem can be solved by providing adequate rations and by avoiding strains of birds which have any inherent weakness of shell texture."

The interior quality of eggs produced by caged birds was high. The yolk was very uniform in color and the flavor excellent.

Practical guide to battery egg production, L. ROBINSON (*Woking, Surrey, [Eng.]: John R. Harvey, S. P. B. A. Supplies, [1946]*, pp. 97+, illus. 34).

Composition and productive energy of poultry feeds and rations, G. S. FRAPS (*Texas Sta. Bul. 678 (1946)*, pp. 37).—Based on an extensive series of investigations (*E. S. R.*, 58, p. 868; 81, p. 408; 90, pp. 89, 518; 93, pp. 184, 334), methods are presented for calculating the productive energy and digestible protein of feeds for chickens from the chemical analysis by the use of production coefficients. Extensive tables present digestion coefficients, energy-production coefficients, average composition, minimum guarantee, productive energy, and digestible protein of many feeds used in poultry rations. Calculation of the productive energy in a number of mixed rations recommended by various experts gave average values in therms per 100 lb. as follows: All-mash chicken starter, 81.6; all-mash growing diet 87.9, and with grain, 91.7; all-mash laying diet 83.1, and with grain, 89.5; and all-mash breeding diet 81.4, and with grain, 86.5. The influence of composition of the ration on composition of the fowl is discussed with emphasis on the fact that fowls making the same gains in weight are not necessarily of the same degree of fatness. It is suggested that feeding experiments with growing fowls should

include data on the quality of the fowl, particularly fat content, since higher gain in weight per unit of feed may result in a fowl containing less fat and of poorer quality than fowls making lower gains in weight.

Photolysis of riboflavin in poultry feeds, O. E. STAMBERG and C. F. PETERSEN. (Idaho Expt. Sta.). (*Poultry Sci.*, 25 (1946), No. 4, pp. 394-395).—When exposed to direct sunlight, with several stirrings, a laying mash lost in 9 days 10.60 percent of its riboflavin and a breeder mash 13.52 percent. Another poultry feed lost only about 15 percent in a 2-week period. It is indicated that in feeds the loss is less rapid than in milk (E. S. R., 93, p. 518) or other solutions.

Shark meal as a protein supplement in chick rations, S. P. MARSHALL and G. K. DAVIS (*Poultry Sci.*, 25 (1946), No. 4, pp. 381-386, illus. 1).—Shark meal prepared by a wet process method was compared with roller process powdered skim milk as a protein supplement in chick rations containing 15.5 percent of total crude protein. Four pairs of lots containing 25 chicks per lot were fed through 12 weeks of age, using an equalized feeding method. Seventy-seven birds that finished the experiment on the shark meal rations gained an average of 776.4 gm., and 83 that finished on the powdered skim milk rations made an average gain of 746.3 gm. The difference in average gains was not significant at the 5-percent level. Nitrogen present in urea and in nonprotein nitrogen other than urea in amounts equivalent to 8.19 percent of crude protein ($N \times 6.25$) contributed by shark meal to one ration apparently did not interfere with the efficiency of the utilization of these rations. Feather picking and cannibalism were common among the birds fed each of the rations. Control measures lessened but failed to eliminate these vices. No fishy or other off-flavor was observed in the broiled meat of chicks fed through 12 weeks of age on rations containing from 9.9 to 13.58 percent of shark meal.

Feed utilization in growing chickens in relation to shank length, E. W. GLAZENER and M. A. JULI. (Md. Expt. Sta.). (*Poultry Sci.*, 25 (1946), No. 4, pp. 355-364, illus. 4).—Data were collected on 222 short-shanked and 138 long-shanked New Hampshires, and 196 short-shanked and 86 long-shanked Plymouth Rocks. The progeny from the long-shanked strains in both the New Hampshires and Barred Plymouth Rocks tended to grow faster and utilize feed better than the progeny from the short-shanked strains, although the early growth and efficiency were better in the short-shanked than in the long-shanked Barred Plymouth Rocks, probably as the result of heterosis.

The degree of variation was greater in body weight than in shank length, and the birds with the longer shank tended to be heavier at 10 weeks of age.

Observations on the choline requirements of hens, H. L. LUCAS, L. C. NORRIS, and G. F. HEUSER. (Cornell Univ.). (*Poultry Sci.*, 25 (1946), No. 4, pp. 373-375).—The present study was a preliminary one designed to test whether a diet known to be low in choline was complete with respect to other nutrients required for egg production and hatchability. Single-Comb White Leghorn hens in good production were used, with eight hens on each of the experimental diets. On a diet composed principally of purified and alcohol-extracted ingredients, and which contained 0.03 percent of choline, egg production and hatchability were only slightly lower than on the same diet supplemented with choline so that the total content was 0.21 percent. It appeared that, under these conditions, the hens synthesized substantial amounts of choline. These observations were supported by certain calculations which indicated that hens, especially high producers, may synthesize significant amounts of choline under practical conditions.

Riboflavin and manganese supplements for high wheat poultry rations, G. L. McClymont and L. Hart (*Agr. Gaz. N. S. Wales*, 57 (1946), No. 4, pp. 219-222).—Experiments are reported in which the hatching percentages were determined with rations containing various wheat products and supplemented or unsupplemented with riboflavin and manganese salts. The authors conclude that "rations with a high proportion of wheat and/or wheat meal, with large or small amounts of meat meal and with or without green feed, need supplementing with riboflavin-rich feeds and manganese to obtain good hatchability. Rations with a high proportion of bran and pollard do not appear to need such supplements."

Effect of riboflavin intake on the content of egg whites and yolks from individual hens, O. E. Stamberg, C. F. Petersen, and C. E. Lampman. (Idaho Expt. Sta.). (*Poultry Sci.*, 25 (1946), No. 4, pp. 320-326, illus. 2).—In this study the eggs laid by individual hens were analyzed for riboflavin during a period of several months at various levels of riboflavin intake. White and yolks were also analyzed separately. The riboflavin analyses were made by the method of Peterson, Dearstyne, Comstock, and Weldon (E. S. R., 95, p. 160). Four Single-Comb White Leghorn pullets were used in the experiments, housed in individual laying cages without access to droppings.

The pullets produced eggs of low riboflavin content when fed a mash containing 2.2 $\mu\text{g./gm.}$ All of the four responded to a mash containing 7.5 $\mu\text{g./gm.}$ of riboflavin, producing eggs of higher riboflavin content, but each responded to a different degree. Increasing the riboflavin content of the mash to 15.7 and later to 26.7 $\mu\text{g./gm.}$ produced practically no further increase. At each level of riboflavin intake the concentration of riboflavin of the eggs produced by an individual pullet varied somewhat from day to day, but it was within a certain level depending on the intake. The first egg of a clutch was generally lower in riboflavin than other eggs.

In the case of two pullets the whites and yolks were analyzed separately during the experimental period of about 5 mo. One hen produced eggs consistently higher in riboflavin concentration in the white and one hen consistently higher in the yolk. Of the four hens studied, three had a higher concentration of the vitamin in yolks. Results on internal yolks from hens which were sacrificed confirmed previous observations that about 8 days were required for the hens to produce eggs at a higher or lower riboflavin level when feeds were shifted. All of the internal yolks of a hen changed at about an equal rate. It is concluded that "all hens respond to an increase in riboflavin intake up to a certain level and produce eggs of a higher riboflavin content. This is important in relation to egg quality as a food."

The influence of different levels of dietary calcium upon egg-shell thickness, with a study of the relationship between egg-shell thickness and porosity, C. Tyler (*Jour. Agr. Sci. [England]*, 36 (1946), No. 2, pp. 111-116, illus. 2).—Thickness measurements made on eggshells from hens fed high-, normal-, and low-calcium diets are reported. The low-calcium diet caused a gradual thinning of the shell, but no soft-shelled eggs. The high-calcium diet did not lead to a general increase in shell thickness, and a number of soft-shelled eggs were found. The position of the egg in a clutch appeared to have no influence on shell thickness or uniformity of shell thickness. No relationship was noted between shell thickness and porosity for eggs produced on normal-calcium diets, but high- or low-calcium diets resulted in the production of shells in which thickness and porosity were significantly and negatively correlated.

The effect of estrogens upon the meat quality of old cocks and hens, P. D. STURKIE. (N. J. Expt. Stas.). (*Poultry Sci.*, 25 (1946), No. 4, pp. 365-368).—Thirty males 18 to 20 mo. of age were successfully treated with diethylstilbestrol and dienestrol. The diethylstilbestrol, in the form of pellets (20 to 25 mg.), was implanted into the shanks or necks of the birds, and it also was injected into shanks and necks. Dienestrol was injected into these sites. Most of the birds received only one implantation or injection. All males were killed on the twenty-ninth day and graded, and later were cooked and scored as to eating quality.

The treatments were effective in improving the grade of the carcass, but they did not increase the gains in weight significantly nor improve the eating qualities of the meat appreciably. Old hens, 2½ yr. of age, were hormonized for a 26-day period, 59 being fed dianisylhexene in the feed at the rates of 0.01 and 0.005 percent; 16 dienestrol in the feed (0.01 percent); and 20 had pellets of diethylstilbestrol implanted into the necks and shanks. The treatments did not influence the feed consumption, egg production, gain in body weight, or market quality of the carcasses.

Amount of breast meat and live and dressed grades in relation to body measurements in 12-week-old purebred and crossbred chickens, C. O. FRISCH-KNECHT and M. A. JULL. (Md. Expt. Sta.). (*Poultry Sci.*, 25 (1946), No. 4, pp. 330-345, illus. 2).—The mean values are reported of live body weight, amount of breast meat, and other measurements related to body conformation and market condition for the 256 12-week-old purebred and crossbred progeny of Cornish, New Hampshires, Barred Plymouth Rocks, and their crosses. The degree of variability in these values was greatest for the live body weight and smallest for the shank and keel lengths. The difference in the mean live body weight between the males and females was significant. The mean values of breast depth, body depth, keel length, shank length, observed cross-section breast area, and the ratio of shank length to cube root of body weight tended to be greater in the males than in the females. The mean values of the amount of breast meat, breast width, and breast index were slightly larger in the females than in the males. The mean value of the shank length was only slightly larger than the mean keel length in these progeny.

Live body weight was the best criterion of the quantity of breast meat on chickens at 12 weeks of age, both purebred and crossbred. Breast index did not prove to be a good measure of breast meat. The mean live body weight was significantly larger in the progeny of the Cornish × New Hampshire mating than in the progeny of each of the following matings: Cornish × Barred Plymouth Rock, Barred Plymouth Rock × New Hampshire, purebred Cornish, purebred Barred Plymouth Rock, and purebred New Hampshire. The amount of breast meat in this cross was significantly greater than for any other crossbred or purebred progeny.

Live and dressed grade observations indicated that breast index, as defined in this study, was not a good index of market grade, and observed cross-section breast area proved to be the best criterion. The correlation ratios between flesh measurements and grade were higher than the correlation ratios between shank length and grade. The fastest growing chickens tended to grade the highest. Females tended to grade higher than males, but in the AA grade birds breast meat as a percentage of live weight was higher in males than in females. The strain of New Hampshires was superior to the strain of Barred Plymouth Rocks used in this study with respect to ability to transmit roundness of breast and superior grade of bird in the

progeny. Crossbreeding, involving the use of a Cornish male with New Hampshire and Barred Plymouth Rock females, produced a higher percentage of grade AA and grade A birds than purebred New Hampshire and Barred Plymouth Rock matings.

Breeding Leghorn chickens to increase the life span, R. L. BRYANT (*Virginia Sta. Tech. Bul.* 99 (1946), pp. 8, illus. 1).—An experiment was conducted to determine the feasibility of selective breeding to increase the length of life of Single-Comb White Leghorn chickens. From the original stock of 105 females, two strains were established, one bred for a low percentage of deaths and the other bred for a high percentage of deaths.

Eliminating birds which died from accidents, the deaths during the starting period, 1 day to 8 weeks of age, amounted to 8.05 percent for the short-life strain and 3.39 percent for the long-life strain. During the growing period, 8 to 20 weeks of age, the nonaccidental deaths were 3.99 and 2.50 percent, respectively, and during the laying period, 140 to 525 days of age, they were 29.66 and 17.07 percent, respectively. By the end of the 5-yr. breeding period the average length of life, based on a maximum length of life of 525 days, was 43.9 days greater for the birds in the long-life strain than for those in the short-life strain.

The experiment is deemed to show that resistance to disease and length of life of the domestic fowl can be influenced by selective breeding and progeny testing.

A study of oxygen transport in the blood of young and adult domestic ducks, H. H. ROSTORFER and R. H. RIGDON. (Univ. Ark.). (*Amer. Jour. Physiol.*, 146 (1946), No. 2, pp. 222-228, illus. 5).—The oxygen capacity, hemoglobin content, color index, and dissociation curve for blood are compared for young and adult domestic ducks.

Undersökningar över gasungarnas behov av D-vitamin samt utprovning av en praktisk metod för uppfödning av gäss (The vitamin D requirements of goslings), N. OLSSON (*Lantbr. Högsk. Husdjursforsöksanst. Meddel.* No. 21 (1946), pp. 33, illus. 11; *Eng. abs.*, pp. 32-33).—The vitamin D requirements of Roman, Toulouse, and crossbred goslings during the first weeks after hatching were investigated. Batteries were used to prevent ultraviolet radiation, and vitamin D was supplied to an all-mash ration in the form of cod-liver oil. The method of battery feeding is described. Goslings of Roman geese required for satisfactory growth and normal bone calcification about 30 chick units of D-vitamin (equivalent to the antirachitic effect of 0.3 γ vitamin D₃ on chicks) per 100 gm. of fodder, containing 2.02 percent of calcium and 1.01 percent of phosphorus in the dry matter of the ration. Under the same conditions goslings of Toulouse and other breeds of rapid growth required at least 35 chick units of D-vitamin per 100 gm. of fodder. However, great individual differences in vitamin D requirements were noted, depending on varying external conditions and probably on genetic factors.

Influence of light intensity on ovulation in turkeys, V. S. ASMUNDSON, F. W. LORENZ, and B. D. MOSES. (Univ. Calif.). (*Poultry Sci.*, 25 (1946), No. 4, pp. 346-354, illus. 4).—Bronze hens from three strains and from various combinations of those strains were divided into groups of 10 on the basis of ancestry, date of hatch, and body weight. The groups were placed in separate pens and, except for the unlighted control group, were subjected to different light intensities. Electric lights were turned on in the morning to furnish a 13-hr. day of artificial plus natural light. A minimum light intensity of about 2 footcandles produced maximum response (or nearly so) as measured by the average number of lighted days before the vagina was

perforated and egg production began. Light intensities of 0.3 to 1.0 foot-candle produced a slower response; and dim lights (less than 0.1 foot-candle) had no effect (according to a comparison with unhoused, unlighted birds). Housing without lights retarded egg production.

The total average number of eggs laid to the end of May was about in proportion to the time when the birds started to lay. The starting date of laying and the number of eggs laid before March 1 had no apparent effect on the number produced in April and May. The earlier eggs in the brightly lighted pens were relatively small; those laid in March were slightly smaller than those laid by hens of similar ancestry in the dimly lighted or unlighted pens. The maximum weight attained by birds brightly lighted was less than that attained by those dimly lighted or not lighted at all. It was apparently governed by the age of the hens when they started to lay and by the weight attained at that age.

The pigeon; W. M. LEVI (*Columbia, S. C.: R. L. Bryan Co., 1945, 2 ed., pp. 512+*, *illus. 735*).—This comprehensive and copiously illustrated treatise (E. S. R., 87, p. 562) again deals with such phases as the relationship of pigeon and man (pp. 1–15), breeds and varieties (pp. 16–153), anatomy and physiology (pp. 154–207), genetics (pp. 208–249), diseases, parasites, and pests (pp. 279–333), feeds and feeding (pp. 334–384), housing (pp. 385–415), commercial squab production (pp. 416–440), exhibition, training, etc. (pp. 441–473), and bibliography (pp. 476–489).

DAIRY FARMING — DAIRYING

Live weight versus metabolic body size in dairy cows and goats, W. L. GAINES. (Ill. Expt. Sta.). (*Jour. Dairy Sci., 29 (1946), No. 5, pp. 259–272, illus. 1*).—The author discusses the two philosophies with special reference to lactating maintenance and milk energy yield in cows and goats. He states that “it may be accepted as experimentally established that lactating maintenance per unit live weight as a species average is about twice as high in goats as in cows, or lactating maintenance is proportional to metabolic body size as between the two species. It is equally well established that the same relation does not hold within either one of the two species. Consistently, within species lactating maintenance is proportional to a power of live weight in excess (not significant) of unity.”

For cows six sets of data were available, using FCM_s , milk-energy yield for the first 8 mo. of lactation, and W_1 , live weight within 31 days after parturition. “Four sets support the FCM_s/W_1 philosophy almost perfectly; one set supports neither one of the two philosophies, but the metabolic body size philosophy less poorly; one set falls about half way between the two philosophies. The weight of experimental evidence as between cows distinctly supports the philosophy that FCM_s tends to be proportional to W_1 ; and distinctly contradicts the metabolic body size theory of milk-energy yield (FCM proportional to $kg.^{3/4}$).”

Comparative size of Cornell dairy cows, E. G. MISNER ([*New York*] *Cornell Sta., A. E. 562 (1946), pp. 6+*).—Measurements and weights are tabulated for the purebred dairy cows of the Holsteins, Jerseys, Guernseys, Ayrshires, and Brown Swiss breeds in the Cornell main dairy barn in 1941.

The production influence of 1260 Holstein sires, E. G. MISNER ([*New York*] *Cornell Sta., A. E. 563 (1946), pp. 99+*, *illus. 8*).—This report gives the results of a study of the production influence of 1,260 Holstein-Friesian sires

for which indexes were computed up to September 30, 1942 by the Holstein-Friesian Association of America. Analysis of the rate of production data for the 18,799 daughters of these sires showed that the three-time-milking-mature-equivalent milk production of these cows was 1 percent less than their dams, the percentage of fat in the milk 1 percent more, and the total amount of fat produced per cow exactly the same as for their dams. The conclusion made from this study is that "not enough discretion is exercised in choosing sires that are mated with high producing cows. Such bulls should have a production inheritance index for milk and fat equal to that of the cows with which mated. Both should exceed breed average production by 20 percent or more."

History and development of Holstein cattle in Frederick County, Maryland, J. H. REMSBERG (*Middletown, Md.: Frederick County Holstein Assoc., 1946, pp. 110, about 60 illus.*)—An account of the history of the breed in this county and of the work of the Frederick County Holstein Association.

Smältbarhetsförsök med nötkreatur.—I, II, cellulosa, svenska oljekakor, oljevästavfall, olika fint sönderdelad fodersäd M. M. (Digestibility experiments with various feeds for dairy cattle), F. JARL (*Lantbr. Hogsk. Husdjursforsoksanst. Meddel. No. 20 (1946), pp. 100; Eng. abs., pp. 95-98*).—A series of 46 digestibility experiments with bulls, cows, and heifers, using the "clue substance" method with Cr_2O_3 , is reported. Coefficients are reported with variously treated cellulose feeds, linseed, rape seed, and poppy seed oil cake and mixtures of oil cakes, mustard seed oil meal, linseed straw and chaff, hemp seed offal, clover chaff, ensiled beet pulps, hays from peat and firm soils, and oats and barley ground to various degrees of fineness. English headings for all tables are provided.

Defluorinated rock phosphate as a phosphorus supplement to the rations of dairy cattle, T. W. GULLICKSON and F. C. OLSON. (Minn. Expt. Sta.). (*Jour. Dairy Sci., 29 (1946), No. 5, pp. 317-320*).—A defluorinated rock phosphate was compared with steamed bonemeal in its ability to serve as a satisfactory supplement to phosphorus-deficient rations of dairy cattle. Four grade Holstein heifers about 21 mo. of age were fed similar phosphorus-deficient basal rations during the 17-mo. period of the experiment. During the last 11 mo. two of them were fed steamed bonemeal as a supplement to their rations; the other two received equivalent additions of phosphorus from a defluorinated rock phosphate product. Total phosphorus intakes were kept slightly below the requirements of each animal. Under the conditions of the experiment no significant difference was observed between defluorinated rock phosphate and steamed bonemeal in availability of their phosphorus to dairy cattle. Animals fed the bonemeal made slightly greater gains in weight. No difference was noted in the palatability of the two supplements as fed.

Experiments with iodinated casein on farms in England and Wales, K. L. BLAXTER (*Jour. Agr. Sci. [England], 36 (1946), No. 2, pp. 117-150, illus. 1*).—Trials carried out on 97 widely distributed farms are reported in which paired cows were fed 20 gm. per day of iodinated casein cubes for an experimental period of 6 weeks. It was found that 4 percent of the cows refused the cubes, with an even higher rate in the Channel Island cattle.

The mean increase in daily milk yield was 5.44 lb. or 22.2 percent. This confirmed an initial assay undertaken before the trials began. The total increase in production per cow was approximately 25 gal. Heifers did not increase in yield as markedly as mature cows. When treatment stopped, yields remained elevated for several days and then dropped severely. While this drop could not be prevented, its rate was diminished by feeding addi-

tional food. The gradual reduction of the amount of iodinated casein fed, however, resulted in a more gradual return to normal.

Losses of condition, as judged by comparative score, occurred, and on some farms these losses were quite appreciable. Approximately 20 percent of the cows lost weight as judged by eye. Where cows were weighed it was found that the smaller cows lost the most weight, and that in larger-bodied cows the loss was much smaller. Feeding iodinated casein had no effect on the incidence of mastitis, lameness, or abortion. Over 6 percent of the control cows contracted mastitis, became lame, or aborted during the 8 weeks of observation. It had a significant effect on the incidence of heart abnormalities—chiefly arrhythmia—high respiratory rates, nervousness, digestive disorders such as scouring, and on the presence of symptoms suggesting iodism. Classification of the adverse symptoms associated with hyperthyroidism (with the exception of iodism symptoms) showed that their incidence was greater when the response was high.

[Papers on milk sanitation] (*N. Y. State Assoc. Milk Sanit., Ann. Conf., 22 (1945), pp. 7-20, 53-78, 91-164, 177-242, illus. 20*).—The following are included: Water Supplies for Milk Plants and Dairy Farms, by F. N. Thomson (pp. 7-20); Control of Milk Watering, by P. Corash (pp. 53-66); Quality Control of Milk as it Enters and Leaves the Plant, by E. A. Crawford (pp. 67-78); A Technical Quality Control Program for Dairy Plants, by C. Paley (pp. 91-102); Preliminary Report on Coliform Studies of Pasteurized Milk and Milk Products, by L. Buchbinder and J. W. Fertig (pp. 103-120); Problems in Design, Installation, and Operation of H. T. S. T. Pasteurizers, by C. W. Weber (pp. 121-144); The Future of Fiber Milk Containers, by F. C. Baselt (pp. 145-154); Postwar Milk Bottle, by V. L. Hall (pp. 155-158); Transfer of Unsatisfactory Dairies Between Health Jurisdiction, by C. H. Outwater (pp. 159-164); The Use of Quaternary Ammonium Compounds in the Dairy Industry, by C. A. Lawrence (pp. 177-186); Mastitis Prevention, by I. E. Parkin (pp. 187-198) (Pa. State Col.); Strainer Pad Control of Milk Quality, by C. B. A. Bryant (pp. 199-218); The Origin and Control of Thermophilic Organisms—Some Fundamental Phases, by D. Levowitz (pp. 219-236); and Thermal Death Range of Bacteria in Milk—A New Electric Sampling Device, by F. W. Gilcreas and J. E. O'Brien (pp. 237-242).

[Abstracts of papers in dairy bacteriology] (*Jour. Bact., 51 (1946), No. 5, pp. 575, 587, 589-590*).—The following are included: Significance in Nutritional Research of Correct Identification of *Lactobacillus casei*, *L. delbrueckii*, and *L. bulgaricus*, by M. Rogosa (p. 575) (U. S. D. A.); The Viability of Dried *Lactobacillus bulgaricus* Cultures as Affected by the Temperature of the Reconstituting Fluid, by M. L. Speck and R. P. Myers (p. 587); A Survey of the Coliform Status and Suggested Standards for Coliform Control of Pasteurized Milk in a Large City, by L. Buchbinder and J. W. Fertig (pp. 589-590); and The Effects of Quality and Pasteurization of Milk on the Bacterial Flora and Quality of Cheddar Cheese, by R. P. Tittsler, D. S. Geib, G. P. Sanders, H. E. Walter, O. S. Sager, and H. R. Lochry (p. 590) (U. S. D. A.).

Studies on the effects of transport and storage on the bacteriological quality of raw milk.—I, The reduction of methylene blue by raw milk as influenced by time and temperature of storage, V. R. SMYTHE (*Queensland Jour. Agr. Sci., 2 (1945), No. 2, pp. 128-156, illus. 7*).—Certain aspects of the milk supply of Brisbane are discussed, and trends of air temperature and raw milk quality are illustrated graphically, using data obtained by testing 95,000

milk samples over a period of 3 yr. Methylene blue reduction tests were performed on samples of raw milk collected from 20 farms in the Brisbane milk district and incubated for various periods of time up to 5 hr. at temperatures ranging from 5° to 35° C. The criterion adopted for deterioration in milk quality was the fall in reduction time, represented by the difference between the reduction time prior to incubation and the reduction time after the application of any given treatment.

The fall in reduction time produced by a rise in temperature from 20° to 35° was very marked, but was not strictly linear, the steepest fall occurring when the temperature rose from 25° to 30°. Incubation at temperatures below 20° caused an increase in the reduction time which was noticeable immediately after the initial storage period of 30 min.

At most temperatures an increase in storage time up to 5 hr. produced marked trends, which appeared to be strictly linear. The exception occurred at 10°, at which temperature no effect resulting from the period of storage was shown. A 5° increase in the duration of storage produced a progressive increase in the reduction time. All temperatures above 10° resulted in a marked fall in the reduction time as the storage period increased. The interaction of the time factor and the reduction trends due to temperature change was positive, marked, and almost linear, as was also the reciprocal action of temperature on the trends resulting from time.

As the storage temperature increased, the rate of deterioration (fall in reduction time) was greater in good quality milks than in milks of inferior quality. Furthermore, this rate of deterioration with temperature increased as storage time was prolonged, and such an added deterioration was greater when milk quality was high. No correlation was obtained between the initial quality of a milk and the effect of storage time. The shade air temperature of the day of sampling was found to exert no influence on the observed trends in the methylene blue reduction time.

Research on rancidity in milk greatly advanced since 1726, W. L. DUNKLEY (*Canad. Dairy and Ice Cream Jour.*, 25 (1946), No. 6, pp. 27-28, 68, 70, 72).—This is a review of the status of research on rancidity, particularly the relations of lipase to the problem.

Causes of variation in the butterfat content of milk, V. E. GRAHAM (*Canad. Dairy and Ice Cream Jour.*, 25 (1946), No. 6, pp. 34-36, 64, 66, illus. 2).—This discussion includes data obtained at the University of Saskatchewan, particularly as to the influences of such factors as age of the cow, season of the year, stage of lactation, differences in night and morning milk, changes in temperature, and excitement.

The effect of route delivery on the flavor, riboflavin, and ascorbic acid content of milk, D. V. JOSEPHSON, L. H. BURGWALD, and R. B. STOLTZ. (Ohio State Univ.). (*Jour. Dairy Sci.*, 29 (1946), No. 5, pp. 273-284).—A study of 13 milk routes in Columbus, Cleveland, St. Louis, and Boston showed fair uniformity between them with respect to the total percentage of customers who actually took in their milk within 5 min. or had it protected from light at time of delivery. Weighted averages show that approximately 70 percent of all deliveries either were taken in by the housewife within 5 min., or placed in the house, apartment, delivery box, or refrigerator by the routeman. Between the 5-min. check and the 30-min. recheck period an additional 10 percent of deliveries were taken in, and at the 60- and 90-min. rechecks about 7 and 6 percent, respectively, was removed from the doorstep. During the last hour, between the 90- and 150-min. rechecks, an additional 3 percent was taken in by the housewife. The number of customers who left their milk out more than 150 min. represented 3.3 percent of all deliveries.

Under experimental conditions of exposing milk to sunlight, the loss of ascorbic acid is extremely rapid, with only insignificant quantities remaining after 30 min. Losses of this vitamin in the shade are also quite rapid. Riboflavin losses vary depending upon the intensity of sunlight, the temperature of the milk, and the size of bottles in which the milk is exposed. Under conditions of direct sunlight exposure for extended periods of time, milk loses significant quantities of this vitamin. On the other hand, the loss of riboflavin from milk exposed to shade does not exceed 25 percent of that experienced in the direct sunlight. The photolysis of riboflavin stops when milk is removed from light while losses of ascorbic acid continue at a somewhat slower rate. The "sunlight" flavor, which develops in milk during exposure, appears to be a more critical problem than the loss of some of the riboflavin. On the basis of route studies and certain basic assumptions, it is believed that the average loss of riboflavin in all milk delivered does not exceed 3.25 percent. "It is the feeling of the writers that a program of consumer education in the care of milk can be of great value in maintaining the palatability and nutritional qualities of this important food."

Influence of temperature on the curing of Cheddar cheese, H. C. HANSEN. (Idaho Expt. Sta.). (*Canad. Dairy and Ice Cream Jour.*, 25 (1946), No. 6, pp. 48, 50).—In these tests, when the ripening temperature of Cheddar cheese was increased from 40° to 60° F. the loss in weight in the cheese during 6 mo. was increased from 4.44 to 8.71 percent. Cheese ripened at 40° for 6 mo. was usually criticized for being slightly acid, lacking in flavor, or flat; cheese ripened at 50° was high acid, bitter, or very slightly fruity; cheese cured at 60° was high acid, sharp, or slightly fruity. Cheese made from good milk developed more flavor in 3 mo. at 60° than did cheese cured at 40° and 50° for 6 mo., and that from good-quality raw milk developed more flavor in a shorter time than did cheese made from pasteurized milk, although it was not as uniform in flavor.

VETERINARY MEDICINE

[**Miscellaneous observations**] (*Jour. Amer. Vet. Med. Assoc.*, 108 (1946), No. 831, pp. 422-425, 429-431, illus. 1).—Descriptive accounts are given on Aujeszky's Disease in Wisconsin, by H. H. Hoyt (pp. 422-424); An Outbreak of Rabies in a Dairy Herd, by J. W. McCoy (pp. 424-425); and Leucocytic Changes in the Bovine Animal Eighteen Hours After the Subcutaneous Injection of Tuberculin, by P. D. Beamer (pp. 429-431) (Univ. Ill.).

[**Miscellaneous contributions from Onderstepoort**] (*Onderstepoort Jour. Vet. Sci. and Anim. Indus.*, 21 (1946), No. 1, pp. 7-16, 41-55, 79-98, illus. 6).—Among the articles in this number are Further Investigations Into Immunization of Cattle Against Rinderpest, by D. T. Mitchell and P. L. le Roux (pp. 7-16); Avirulent Anthrax Vaccine, by M. Sterne (pp. 41-43), reporting results of additional tests (E. S. R., 84, p. 523) which "far surpass those obtained with the Pasteur type of spore vaccine"; Recent Investigations Into the Toxicity of Plants, etc., No. XV, by S. J. van der Walt and D. G. Steyn (pp. 45-55), which continues the series (E. S. R., 93, p. 344); and The Familial Incidence of Spontaneous Osteopetrosis gallinarum, by J. D. W. A. Coles and J. J. Bronkhorst (pp. 79-98), a study of 39 cases.

A preliminary study of the occurrence of internal parasites of animals in Mississippi, J. W. WARD. (Miss. Expt. Sta.). (*Helminthol. Soc. Wash. Proc.*, 13 (1946), No. 1, pp. 12-14).—A survey based on findings at autopsy of 349 animals, including horses and mules, cattle, sheep, hogs, chickens,

dogs, rabbits, rats, and quail, revealed at least 86 species of internal parasites. Mule colts were found to be infested with nematode parasites at as early as 15 and 26 days.

Observations on strains of a monophasic *Salmonella* variant. W. B. CHERRY, L. A. BARNES, and P. R. EDWARDS. (Ky. Expt. Sta. et al.). (*Jour. Bact.*, 51 (1946) No. 2, pp. 235-243).—Attention is called to a recently observed increase in the prevalence and distribution of a monophasic *Salmonella* type with the antigenic formula IV, V, XII: e,h-. The organisms have been recovered from swine, fowls, and in man from asymptomatic carriers, sporadic case, and epidemics of gastroenteritis. The strains appear to be endemic in California and Hawaii. It is suggested that the designation *S. reading* for this organism should be subjected to further scrutiny until more direct evidence of its probable diphasic ancestry is acquired. Certain of the clinical and epidemiological characteristics of infections due to this group of organisms are described.

Extensive biochemic and serologic experiments cited were designed to detect, if possible, some clue as to the derivation of the monophasic variants. Serologic results were not fruitful, but the suggestion is made that the strains may have developed as a result of a biochemic variation correlated with an antigenic alteration. Some possible further lines of approach are mentioned.

The segregation of antigens in a bacterial culture by an undescribed form of variation. P. R. EDWARDS. (Ky. Expt. Sta.). (*Jour. Bact.*, 51 (1946), No. 4, pp. 523-529).—*Salmonella hormaechei* (XXIX [Vi]:Z₃₀,₃₁) of Monteverde was found to dissociate two loss variants represented by the formulas XXIX [Vi]:Z₃₀ . . . and XXIX [Vi]:Z₃₁ The two variants had no major H antigens in common, but in combination they possessed all the antigens of the parent culture. The variants were apparently stable types which arose through a hitherto undescribed form of variation. The possible bearing of this variation on the origin of *Salmonella* types is briefly discussed.

A localized outbreak of *Salmonella* food poisoning apparently transmitted by a hen's egg. M. CROWE (*Jour. Hyg. [London]*, 44 (1946), No. 5, pp. 342-345).—An outbreak of *Bacillus aertrycke* food poisoning involving 23 of 27 exposed persons is described. The vehicle was a butter extender including a raw egg.

***Salmonella* infection in man conveyed by ducks' eggs.** P. C. MALLAM and R. ALHADEFF (*Lancet [London]*, 1946, I, No. 24, pp. 887-888).—A report is given of a case of severe food poisoning in a woman who had eaten a fried duck egg. Infection with *S. typhimurium* was indicated.

Om forgiftningstilfeller ved bruk av kloralhydrat blandet med natriumbikarbonat mot acetonuri hos ku (On intoxications by the use of chloral hydrate and sodium bicarbonate against acetonuria in cows, S. NESSE and A. W. BUER (*Norsk Vet. Tidsskr.*, 58 (1946), No. 5, pp. 196-200; *Eng. abs.*, p. 200).—On treating cows suffering from acetonuria with a compound consisting of chloral hydrate and sodium bicarbonate, several intoxications, partly with fatal results, have occurred. Analyses showed that both of the constituents were of a degree of purity which generally would be accepted, but it is thought that their mixing may have decomposed the chloral hydrate into a toxic compound.

Control of brucellosis in New York State dairy herds and its relation to the milk supply. A. WINTER (*N. Y. State Assoc. Milk Sanit., Ann. Conf.*, 22 (1945), pp. 79-90).—This deals especially with the New York State program.

Injury as a cause of mastitis, W. G. STEVENSON (*Canad. Jour. Compar. Med. and Vet. Sci.*, 10 (1946), No. 4, pp. 115-116).—Instances are cited in a herd of 35 to 40 cows in which there had been over 50 percent of mastitis cases within a year. It was noted that in several animals the mucous membrane of each teat sphincter was slightly everted, and that the milking machine in use was shown by a new gage to be developing 19 in. Hg-negative pressure. Following the adjustment of the vacuum and intrammary infusion of sodium penicillin, "the serious trouble disappeared although the infection persisted."

The isolation of diphtheroids from apparently normal cows, E. S. FEENSTRA, F. THORP, and C. F. CLARK. (*Mich. Expt. Sta.*). (*North Amer. Vet.*, 27 (1946), No. 5, pp. 288-289).—Diphtheroids, some of which were similar to those isolated from cases of pyelonephritis in cows, were isolated from urine specimens and vaginas of apparently normal cows. The pathogenicity of these cultures was not established.

Clostridium infection in range animals, J. F. RYFF and A. M. LEE. (*Wyo. Expt. Sta.*). (*Jour. Amer. Vet. Med. Assoc.*, 108 (1946), No. 831, pp. 385-388).—A table is given identifying the organisms isolated in 25 cases in cattle and sheep examined for *Clostridium*.

The probable origin of some unusually heavy infections with the common sheep hookworm (*Bunostomum trigonocephalum*), R. T. HABERMANN. (*U. S. D. A.*). (*Helminthol. Soc. Wash. Proc.*, 13 (1946), No. 1, pp. 11-12).—Examination at necropsy of 89 sheep infected with *B. trigonocephalum* are reported. The average infection in one group of 34 sheep was 50.1 hookworms, and of the remaining 55, 86.8 hookworms, but two 5-year-old rams in the latter group harbored 634 and 982 hookworms, respectively. These rams had been kept for about 6 mo. with other sheep in small or overstocked quarters with deep bedding, uneaten hay, and excreta.

Method for the recovery of *Nematodirus* adults, eggs, and larvae for experimental purposes, C. A. V. BARKER (*Canad. Jour. Compar. Med. and Vet. Sci.*, 10 (1946), No. 4, pp. 117-119).—A new procedure devised for obtaining uncontaminated infective material of *Nematodirus* spp. from the feces of sheep harboring several species of nematodes is described as a substitute for Kauzal's method (*E. S. R.*, 82, p. 791), which did not yield a sufficient number of eggs in animals not heavily infected. The material was obtained from approximately the first 20 ft. of the small intestine of lambs, and the technic described always resulted in pure cultures of *Nematodirus* larvae suitable for experimental purposes.

Studies made of lead arsenate for sheep tapeworm, J. W. WARD and J. W. SCALES (*Miss. Farm Res. [Mississippi Sta.]*, 9 (1946), No. 2, p. 6).—Tests were carried on with 13 infected lambs with varying stages of diarrhea, 11 lambs receiving 0.5 gm. each of lead arsenate in a gelatin capsule and 2 receiving 1 gm. each. No parasites or tapeworm eggs were found 4 days after treatment until 5 to 12 weeks later. The diarrhea also subsided, although 2 animals required re-treatment after 5 weeks.

Isolation of *Brucella suis* from boar's semen, L. M. HUTCHINGS and F. N. ANDREWS. (*Purdue Univ.*). (*Jour. Bact.*, 50 (1945), No. 6, pp. 715-716).—Bacteriologic examination of 92 semen samples collected from six infected boars yielded *B. suis* in 63 of the samples. All six boars eliminated *B. suis* in the semen at some time during the observation period, and three of the boars continuously eliminated *B. suis* in the semen. Despite a steady decline in serum agglutination response in five of the six boars, a corresponding decline in the elimination of *B. suis* in the semen was not observed. Clinical

manifestations of brucellosis were noted in two of the six infected boars. These studies indicate that the infected boar is commonly an important reservoir of *B. suis* and that the bacteria are freely disseminated in the semen.

Antibody response of swine to repeated vaccination with formalin-inactivated, purified swine influenza virus. I. W. MCLEAN, JR., D. BEARD, A. R. TAYLOR, D. G. SHARP, and J. W. BEARD (*Soc. Expt. Biol. and Med. Proc.*, 60 (1945), No. 1, pp. 152-159, illus. 3).—Continuing earlier work (E. S. R., 94, p. 258), it was found that the antibody response of swine to a second vaccination with formalin-inactivated swine influenza virus was greatly influenced by the period between vaccinations. Second vaccination at intervals of 1 to 4 weeks resulted in antibody titers and amounts progressively greater in direct relation to the length of the interval. In parallel higher antibody levels were maintained for longer periods in those animals receiving the second vaccination after the longer intervals. Considering the height of titer after the second vaccination, together with the rapid loss of antibody after the first injection, the interval between vaccinations optimum for maintenance of the highest antibody levels appeared to be about 3 weeks.

Transmission of *Sarcocystis* to swine. L. A. SPINDLER, H. E. ZIMMERMAN, JR., and D. S. JAQUETTE. (U. S. D. A.). (*Helminthol. Soc. Wash. Proc.*, 13 (1946), No. 1, pp. 1-11).—A series of 16 experiments to ascertain the mode of transmission of *Sarcocystis* to swine and the clinical pathologic effects of the parasites on the host animals revealed that pigs, dogs, cats, rats, mice, and chickens are, after consuming flesh of infected swine, capable of transmitting *Sarcocystis* through elimination, with their feces and/or urine, a stage that is infective to swine, the latter becoming infected by consuming such feces or urine. In these experiments, transmission was not accomplished by feeding feces and urine eliminated by animals prior to 15 days after infected flesh had been consumed, but infection was accomplished by such feeding subsequent to 15 days.

Pigs fed feces and urine of pigs, rats, and mice that had not consumed meat did not become infected with *Sarcocystis* and showed none of the symptoms and lesions observed in infected animals. Pigs fed infected flesh did not acquire *Sarcocystis* unless they consumed their own feces and urine. The heaviest infections were found in those animals that consumed the greatest amounts of urine along with the feces.

Symptoms observed in pigs following ingestion by these animals of heavily infected flesh included vomiting, diarrhea, inappetence, weakness of the loins, and temporary posterior paralysis. Symptoms observed in pigs fed feces and urine eliminated by animals subsequent to consumption of infected flesh included unthriftiness, weakness of the loins, and temporary posterior paralysis, sometimes recurring at intervals. Pigs found at autopsy to harbor the heaviest infections were the most severely affected. In general, infections of 40 or more sarcocysts per gram of diaphragm tissue were associated with unthriftiness and stiffness of the muscles. Lesions found at autopsy of the infected animals were enlargement and paleness of the kidneys and hyperanemia of the mucosa of the stomach and intestines.

The efficacy of sodium fluoride in removing ascarids of swine. R. W. ALLEN and L. D. JONES. (U. S. D. A. et al.). (*North Amer. Vet.*, 27 (1946), No. 6, pp. 358-360).—Continuing earlier work (E. S. R., 94, p. 521), four tests involving a total of 60 hogs were conducted to determine the efficacy of sodium fluoride as an ascaricide when administered as 1 percent by weight of the feed for 1 day. The percentage efficacies of the treatment in the four tests

were, respectively, 94.6, 95.6, 98.8, and 96.7. On the basis of the evidence at hand, the dosage used seemed to be reasonably well tolerated by the test animals.

On the etiology of epizootic or infectious equine abortion, M. W. HENNING (*Onderstepoort Jour. Vet. Sci. and Anim. Indus.*, 21 (1946), No. 1, pp. 17-40).—Continuing earlier work (E. S. R., 91, p. 75), two additional outbreaks are reported, both with a very high incidence. In the majority of the abortions studied the fetal organs were found to be extensively invaded by *Salmonella abortus-equi*, but in others this organism could not be recovered from the fetus or afterbirth. Both donkey and horse mares were found to be susceptible, donkeys being on the whole more resistant than horses. Abortion was successfully produced in both horse and donkey mares by means of (1) the oral administration of minced *S. abortus-equi* infected fetal organs, (2) intravenous inoculation of collodion membrane or Berkefeld candle filtrates of these organs, and (3) the oral administration of minced fetal organs that were culturally free from *S. abortus-equi*.

It is concluded that the primary cause of infectious equine abortion is an infecting agent that will pass either through collodion membrane, with the size of the pores 810 μ , or through Berkefeld candles. The advisability of further investigating the etiological significance of *Salmonella* encountered in epizootic diseases like calf paratyphoid and fowl typhoid is suggested.

Equine infectious anemia in brood mares and their offspring, C. D. STEIN and L. O. MOTT. (U. S. D. A.). (*Vet. Med.*, 41 (1946), No. 8, pp. 274-278, illus. 4).—Continuing earlier work (E. S. R., 88, p. 683), transmission studies on equine infectious anemia were conducted in 1942 and 1943 with 7 susceptible brood mares and 14 colts, the latter varying in age from suckling to 3 yr. The strains of virus used were from horses experimentally infected with strains isolated from field cases occurring in Wyoming, New York, and California. The mares in the experiments were of the light type and were held in screened isolation stables with concrete floors. The colts were born and raised in an isolated breeding unit.

No definite evidence was obtained that foals may become infected with infectious anemia with typical clinical symptoms by suckling their infected dams or by close contact with their dams. In one of three cases, questionable evidence was obtained to indicate the possibility that a highly modified sub-clinical form of the disease may be so transmitted. This confirms previous findings that it is difficult to transmit the disease by administering infective material per os or by direct contact.

Milk from infected dams imparts no immunity to sucking colts since the latter animals are susceptible to artificial infection. Pregnant mares, when infected, may or may not abort their fetuses during febrile attacks. Full-term but weak infected colts may be foaled by infected mares. Surviving foals from infected mares may be inapparent carriers. The milk secretion and intrauterine circulation of infected mares may contain the virus. Normal suckling colts and weaned colts of different ages are as susceptible to the virus by subcutaneous injection as adult horses.

Influence of anesthesia on experimental western equine encephalomyelitis, S. E. SULKIN, A. GOTH, and C. ZARAFONETIS (*Science*, 104 (1946), No. 2690, pp. 53-54).—Anesthesia by ether was found to be effective in the treatment of western equine encephalomyelitis in mice. When treated with deep ether anesthesia soon after the intracerebral injection of western equine virus, only 58 percent of the mice developed the disease as compared with 92.4 percent of control animals. When anesthesia was delayed the approximate

length of the incubation period, 60 percent of the animals developed the disease as compared with 92.4 percent of the controls. In addition, ether anesthesia delayed the development of central nervous system symptoms not only when administered soon after the injection of the virus but also when administered after the disease had progressed far enough to cause objective signs of encephalitis.

Clinical observations of "1080" poisoning, E. J. FRICK and F. W. BOEBEL (*Vet. Med.*, 41 (1946), No. 6, pp. 196-197).—The authors conclude from a test of this new rodenticide on two horses that it appears to act primarily on the heart and is a slow-acting poison for solipeds. That it is very toxic was indicated by the small amount proving lethal—5 mg. per kilogram body weight. Heart muscle from poisoned animals transmitted the poison to other animals consuming it; apparently it has an affinity for cardiac tissue. There was practically no struggling or violence shown by the animals used in the test.

The chemotherapy of cecal coccidiosis (*Eimeria tenella*) of chickens.—IV, Experiments on the use of chemotherapy during the immunizing exposure of chicks, W. E. SWALES (*Jour. Amer. Vet. Med. Assoc.*, 108 (1946), No. 331, pp. 393-400, illus. 2).—In this part of the series (E. S. R., 95, p. 251), the protective effect of small amounts of sulfamerazine in the feed of chicks at the time they are exposed to oocysts of *E. tenella* has been tested experimentally. One gm. of the drug per pound of dry mash, given for the first 6 days of exposure, resulted in complete protection of the chicks against fatal cecal coccidiosis, yet allowed them to develop a strong degree of resistance; when challenged in 14 days, the chicks were found to be immune. Other doses and periods of medication were tried and found to be less efficient. It is suggested that other sulfonamides which include the pyrimidine-ring structure will be likewise protective.

In these experiments, the blood hemoglobin levels of the chicks were used as measurements of the degree of resistance to cecal coccidiosis. The records of the weights of the bird did not reveal any serious effect from the "chemically protected" exposure to coccidiosis.

"The practical application of this work might involve a system whereby infected chicks should be treated immediately by the sulfonamide method as previously demonstrated, and that succeeding groups of chicks on the contaminated premises should be accorded the protective treatment while they are acquiring immunity from exposure to contaminated floors."

Effect of vitamin K deficiency on liver lipids in the chick, J. B. FIELD and H. DAM (*Soc. Expt. Biol. and Med. Proc.*, 60 (1945), No. 1, pp. 146-148).—The hypoprothrombinemia induced in chicks by feeding a vitamin K-free diet was not significantly influenced by the addition of choline to the diet. Chicks raised on a vitamin K-free diet exhibited the typical hypoprothrombinemia, but their fibrinogen levels and total liver lipids resembled those of control chicks. The total lipids of the livers of chicks receiving synthetic diets were somewhat increased over the lipids from chicks given a natural ration, but this condition was not corrected by vitamin K.

The status of avian pneumoencephalitis and Newcastle disease in the United States, J. R. BEACH. (Univ. Calif.). (*Jour. Amer. Vet. Med. Assoc.*, 108 (1946), No. 331, pp. 372-376).—"The purpose of this communication is to clarify the rather confusing situation created by application of the term 'avian pneumoencephalitis' on the west coast and 'Newcastle disease' on the east coast to what appears to be the same disease. To accomplish this purpose, a brief historical review of our observations and studies of the disease is presented."

Preliminary observation on the modification of a strain of Newcastle disease virus by intracerebral passage through ducklings, A. KOMAROV and L. GOLDSMIT (Vet. Jour., 102 (1946), No. 7, pp. 212-218).—The virus used in this study was recovered from an outbreak of disease in fowls in northern Palestine characterized by respiratory-nervous symptoms and associated with over 80 percent mortality. It was maintained by serial passages in fowls and passaged intracerebrally in a series of pigeons. Apparently 9 such passages did not modify its virulence for fowls, but 14 passages in ducklings modified the strain. Fowls inoculated intradermally into the wattle with virus modified by 10 intracerebral duck passages did not develop symptoms of Newcastle disease. They were apparently immunized and resisted an inoculum of fowl virus which killed control birds in 4-5 days. Immunity to the virulent fowl virus was apparently fully established 18 days after inoculation of the birds with modified duck virus.

Studies on pullorum disease using various rapid antigens, W. B. DURRELL (Canad. Jour. Compar. Med. and Vet. Sci., 10 (1946), No. 5, pp. 143-148).—A flock of 1,467 birds was subjected to rapid tests, using 4 antigens: (1) Regular, containing *Salmonella pullorum*, strains 4, 10, and 11; (2) variant, containing *S. pullorum*, Younie strains 2 and 296; (3) commercial, containing *S. pullorum*, Regular + Younie; and (4) commercial containing *S. pullorum*, Regular. A correlation of serological findings in a flock and bacteriological findings in the gonads of reactors revealed that regular antigen detected 92 percent, variant 78, commercial (R + Y) 100, and Commercial (R) 86 percent of the total infected birds. A case of leucosis was detected by one antigen, commercial (R + Y). This was the only evidence of possible antigenic hypersensitivity encountered.

Of the male and female gonads of reactors, 40.6 percent were found to be harboring the causative organism in its "typical" or "atypical" form. Pullorum testing prior to the hatching season is deemed of epidemiological importance. Due to antigenic difference of variant and regular strains, a mixed antigen is necessary to detect the heterologous agglutinins. The necessity for retests of infected flocks was also confirmed by this work.

"By proper interpretation of mixed antigen agglutination, use of fly control measures, incubator disinfection, and modern knowledge of poultry husbandry, losses in a poultry plant from this disease should be materially decreased in forthcoming years."

A survey of avian salmonellosis in Great Britain, R. F. GORDON and A. BUXTON (Vet. Jour., 102 (1946), No. 7, pp. 187-206, illus. 2).—During the period 1933-44, out of a total of 6,578 groups of chicks examined 273 were infected with *Salmonella* organisms other than *S. pullorum* and *S. gallinarum*. There has been a definite increase in the occurrence of avian salmonellosis during the last 3 yr. of the period under review, and it is now second only to *S. pullorum* as a cause of fatal septicemia in young poultry. The strains of *Salmonella* organisms isolated were *S. pullorum*, *S. gallinarum*, *S. typhimurium*, *S. thompson*, *S. enteritidis*, *S. californica*, *S. bareilly*, *S. montevideo*, *S. anatum*, and *S. london*. The occurrence of *S. californica*, *S. bareilly*, *S. montevideo*, *S. london*, and *S. anatum* among poultry in Great Britain is reported for the first time. Chicks and ducklings were the species of poultry most commonly affected, but *Salmonella* organisms were also isolated from adult fowls, ducks, turkeys, turkey poults, goslings, pheasant chicks, pigeons, guinea fowls, and a sparrow.

The importance of avian salmonellosis is stressed, both from the agricultural and public health points of view. The epidemiology is discussed, and suggestions are made regarding methods of control and eradication.

Studies on flagellates from domesticated birds.—I, The behavior of *Trichomonas gallinarum* in culture, M. W. KAY. (Ohio State Univ.). (*Jour. Expt. Zool.*, 101 (1946), No. 3, pp. 407-424, illus. 3).—This is a detailed study of this organism in culture.

AGRICULTURAL ENGINEERING

Farm mechanics text and handbook, G. C. COOK, L. L. SCRANTON, and H. F. MCCOLLY (Dansville, Ill.: Interstate, 1946, [rev. and enl.], pp. 744, illus. 520).—This revised and enlarged handbook (E. S. R., 75, p. 130) contains sections on woodwork and farm carpentry; painting, refinishing, and glazing; rope work; harness work; sheet metal work; farm forge work; welding; transmission of power by pulleys, belts, and shafts; farm motors; trucks and tractors; concrete work; farm buildings; farm home conveniences and sanitation; rural electrification; soil and water management; and processing farm products. The design of the book is such that it should lend itself well as a basic text for any of the usual types of farm mechanics courses.

Bluegrass terrace outlet channel design, D. D. SMITH. (Maine Expt. Sta. coop. U. S. D. A.). (*Agr. Engin.*, 27 (1946), No. 3, pp. 125-130, illus. 8).—Bluegrass terrace outlet channels were tested hydraulically at two growth stages, one in late May when the grass was headed out and offered its greatest resistance to flow, and the other in the late fall when only the pliable leaves shingled the channel to give a very smooth flow surface. Depth of flow varied from a fraction of an inch to about 1 ft. to give design data for the grass erect, through shingling, and when shingling was completed. Maximum average velocity of flow was limited by the density of grass that the soil can produce and maintain, the possibility of damage from rodents, cattle, and farm machinery, and the uncertainty of maintenance and weather.

Recommendations are made for a 4 f. p. s. average velocity for the claypan prairie soils of Missouri, and for velocities up to 8 f. p. s. for soil and climate areas in which high quality sod with a density of 7 to 8 strikes per needle can be assured over a long period of time. A design chart is presented by which outlet size may be determined quickly when the maximum velocity of flow has been selected and the slope of the outlet and the expected maximum quantity of flow are known.

General purpose soil auger, J. L. NIELSEN and B. G. WEST. (U. S. D. A.). (*Colo. Farm Bul.* [Colorado Sta.], 8 (1946), No. 3, pp. 2, 15, illus. 1).—Results of practical experimentation with a number of types of soil augers indicate that a single-twist ship auger of $\frac{3}{4}$ - to 1-in. diameter is the best for general purposes. In construction it is ground off and the point sharpened to an angle of about 30°. The shaft of the bit is welded to a piece of $\frac{1}{4}$ in. heavy-duty water pipe of a length adjusted to individual needs. Materials and labor for a 6-ft. auger cost approximately \$3.

Sugar-beet harvester trials in Michigan in 1945, C. M. HANSEN, L. E. SMITH, and R. W. BELL (*Michigan Sta. Quart. Bul.*, 28 (1946), No. 4, pp. 338-343, illus. 2).—These data for 1945 supplement those previously noted (E. S. R., 94, p. 525).

Mechanical field loading of sacked potatoes, W. J. PROMERSBERGER, J. C. RUSSELL, and A. MALLOW (*North Dakota Sta. Biom. Bul.*, 8 (1946), No. 5, pp. 26-31, illus. 5).—An experimental one row mechanical field loader for sacked potatoes has been designed, built, and tested under actual field conditions. The loader consists of an elevator about 11.5 ft. long mounted across a four-wheel trailer made from an old automobile chassis. The entire loading

unit is attached to the truck being loaded by a special hitch arrangement. The elevator frame is constructed of angle iron and the conveyor is a standard conveyor chain normally used for transporting potatoes from bin to cleaning and sorting machinery with pieces of garden hose bolted crosswise at 16 in. intervals to aid in elevating the sacks. Power for the mechanism is provided by a 1½-hp. gasoline engine connected through an automobile transmission which serves as a variable step speed reducer. When the transmission is in second gear a highly satisfactory elevator speed of about 180 ft. per minute is provided. Ordinary hand loading requires four men besides the truck driver, but mechanical loading requires only three men besides the truck driver, two men on the truck to build the load and one man that lifts the sacks from the ground to the elevator a distance of about 10 in. The loader rides on a platform just ahead of the elevator. The platform and lower end of the elevator are adjustable vertically so that they can both be set close to the ground while loading and raised for transporting. The authors report that field loading tests indicate that untrained loading crews handled more sacks per man per minute by using the machine than when loading by hand.

Grass seed harvesting, cleaning, and processing: A summary of techniques developed by the Soil Conservation Service, U. S. Department of Agriculture, J. E. SMITH, JR. (U. S. D. A.). (*Oklahoma Sta. Bul. 295 (1946), pp. 96-99*).—The author presents recommendations for the selection of combine types to be used in grass seed harvesting, together with the necessary adjustments of the machines when collecting the seeds of bluestems, gramas, lovegrasses, buffalo grass, western wheatgrass, Canada wild-rye, and switchgrass. Suggested cleaning and processing operations for these grasses are also given.

Curing bright tobacco with coal and oil, E. M. MATTHEWS, M. H. MCVICKAR, and R. B. DAVIS, JR. (Virginia Sta. Bul. 396 (1946), pp. 8, illus. 4).—The authors present test comparisons of curing bright leaf tobacco using coal and oil stoker installations in barns of 500-stick capacity. Equipment and installation costs of the two systems were approximately \$200 for oil and \$325 for coal. However, average costs for fuel for curing 520 lb. of tobacco by oil was \$8.69 while for 538 lb. of tobacco by coal it was \$3.52. Normally 1½ to 2 cords of unpeeled pulpwood are required for curing an equal quantity of tobacco, and using a figure of average cost per cord of \$12 either system has a definite advantage over wood.

A study of moisture absorption of hay when exposed to atmospheres with various moisture content, S. T. DEXTER, W. H. SHELDON, and D. ROSE (Michigan Sta. Quart. Bul., 28 (1946), No. 4, pp. 317-319, illus. 1).—Samples of freshly cut and barn dried alfalfa hay were exposed to atmospheres of various selected relative humidities to observe their effect on the moisture absorption of hay. Results obtained enable the conclusion to be drawn that the relative humidity of the atmosphere need not be known with any great degree of accuracy in order to operate a mow-drier effectively. When the humidity is greater than 85 percent—which is common only during actual rain or fog—little water is evaporated from damp hay, and the function of the blower is largely to keep the hay from heating. Operation of the blower at night, when humidities are relatively high, seems to offer little possibility of depositing moisture in partly cured hay. If water is absorbed from the damp air, it will be only at the bottom of the mow and by hay that is already dry enough to keep. This partially dried air would then be capable of evaporating water from the upper, damper layers of hay. Until the top layer

of the hay has dried, the only time that it seems advisable to turn off the fan is during fog or heavy rainfall.

Building your new house, M. and G. CATLIN (*New York: A. A. Wyn, 1946*, pp. 267, illus. 42).—A practical treatment of the problem, based on the authors' building experiences, with their mistakes as well as their foresight candidly recorded.

Master service manuals: Household refrigeration manual No. 1, K. M. NEWCUM (*Detroit, Mich.: Business News Pub. Co., [1946], pp. 144, illus. 115*).—This manual contains basic information on the theory and principles of refrigeration and discusses the characteristics of the common refrigerants and the major parts of household refrigeration systems, including their adjustment, repair, and replacement. It forms the groundwork for step-by-step instructions on servicing all types of household refrigerators.

Sewage and garbage disposal on the farm, J. W. ROCKEY and J. W. SIMONS (*U. S. Dept. Agr., Farmers' Bul. 1950, rev. (1946), pp. 28+, illus. 17*).—This revision (*E. S. R.*, 91, p. 204) is a guide to up-to-date methods for the sanitary disposal of sewage and other household and farm wastes. It tells how to construct and maintain satisfactory sanitary facilities, and gives special attention to the questions on sanitation asked most frequently by farm people. Where there are no specific local requirements it may be accepted as a guide to safe practice.

Watch your step: Avoid farm accidents (*U. S. Dept. Agr., Misc. Pub. 608 (1946), pp. 32, several illus.*).—This publication is a revision of and supersedes Miscellaneous Publication 481 (*E. S. R.*, 86, p. 844).

AGRICULTURAL ECONOMICS

[**Papers and notes on agricultural economics**] (*Jour. Farm Econ.*, 28 (1946), No. 2, pp. 413–607, about 19 illus.).—Included are the following papers, not noted elsewhere: International Price Control Through Buffer Stocks, by O. Zaglits (pp. 413–443); Production and Welfare Objectives for American Agriculture, by T. W. Schultz (pp. 444–457); The National Food Allotment Program, by R. Schickele (pp. 515–533); Economic Functions and Units in Farm Organization, by R. J. Smith (pp. 534–542) (*Univ. Calif.*); and Benefits From Irrigation Under Sub-Humid Conditions, by A. Joss (pp. 543–559).

The following notes are included: National Income and Farm Income, by J. D. Black (pp. 560–562); Some Theoretical Aspects of Agricultural Parity Price Policies and National Employment, by H. R. Wellman and G. L. Mehren (pp. 563–571) (*Univ. Calif.*); Agricultural Prices and National Income, by A. P. Ruderman (pp. 571–575); A Quantitative Comparison of Agricultural Price Plans, by W. C. Waite (pp. 575–587) (*Univ. Minn.*); An Approach to the Determination of Intraseasonal Shifting of Demand, by G. L. Mehren and H. E. Erdman (pp. 587–596) (*Univ. Calif.*); Tailored Credit for Land Improvements, by J. D. Black (pp. 596–604); and Agricultural Economists' Views on Farm Price Policy (pp. 604–607), a summarization of the views of 305 agricultural economists in a survey by the committee on parity concept of the American Farm Economic Association.

Foreign Agriculture [June-July 1946] (*U. S. Dept. Agr., Foreign Agr.*, 10 (1946), No. 6–7, pp. 81–104, illus. 5).—Included are the following articles: Structure of Agricultural Prices and Wages in Colombia, by J. A. Hopkins (pp. 82–96), the general objective of which is to appraise the general, overall economic efficiency of Colombian agriculture; Policy Measures and Food Production in Venezuela, by O. Moore (pp. 96–104), in which the high-cost

economy of the country, foreign-trade control, agricultural-production policy, etc., are discussed; and Soviet Aid to Agricultural Specialists, by S. Goodstein (p. 104), describing the terms of the decree issued by the Soviet Government on November 2, 1945, for the improvement of the material welfare of agricultural specialists in the Soviet Union.

Input-output relationships in fattening cattle, A. G. NELSON. (U. S. D. A.). (*Jour. Farm Econ.*, 28 (1946), No. 2, pp. 495-514, illus. 5).—"The purpose of this paper is (1) to set up and analyze input-output relationships throughout the fattening period of calves, yearlings, and 2-year-old feeders; (2) to point out significant relationships; and (3) to indicate the usefulness of this analysis in the development of necessary food programs and as the foundation for an analysis of costs and returns relationships.

"The efficiency with which feed is utilized in the production of food and food constituents at various stages in the fattening period is indicated by an analysis of relationships in data on feed consumption, gain in live weight, slaughter grade, dressing percentage and body composition during the fattening period."

Charts show for the three types of animals throughout the fattening period the relations of live weight and of weights of chemically determined constituents of the edible body to total quantity of feed consumed; gain of live weight to 100 lb. of total digestible nutrients consumed; gain in edible body nutrients per 100 lb. of total digestible nutrients consumed; and gain in edible crude protein and edible ether extract per 100 lb. of total digestible nutrients consumed. Tables show (1) the estimated percentage increase in live weight, edible body and edible nutrients on choice feeder steers fattened to average good and average choice slaughter grades, and (2) comparison of edible product and food nutrients produced per 1,000 feed units by fattening cattle and other livestock. The charts and tables, together with others, have been presented and discussed in U. S. D. A. Technical Bulletin 900 (E. S. R., 94, p. 387).

Feed consumption and the production of pork and lard, L. J. ATKINSON and J. W. KLEIN (*U. S. Dept. Agr., Tech. Bul. 917* (1946), pp. 21+, illus. 4).—"The same basic data for 12 feeding experiments in five Corn Belt States are used as in Technical Bulletin 894 (E. S. R., 93, p. 788). The present study explores further the relationship between feed consumption and the output of different constituent elements of the hog carcass. The purpose of the bulletin "is to show the relationships between consumption of feed by hogs and output of pork and lard. These relationships are analyzed for three sets of assumptions: (1) The total number of hogs is assumed to be fixed. The feed consumption is then related to the output of live weight, dressed weight, and edible pork and lard resulting from hogs marketed at specified weights and resulting from specified changes in marketing weight. (2) The supply of feed is assumed to be fixed, whereas the number of hogs varies. The feed consumption is related to the output of pork and lard at specified weights and to indicated changes in marketing weights. (3) One of the two joint products is assumed to be fixed while the other varies. (a) The output of pork is assumed to be fixed while the number of hogs varies. Changes in feed consumption are related to changes in output of lard between specified points as the marketing weight of hogs changes. (b) The output of lard is assumed to be fixed while the number of hogs varies. Changes in feed consumption are related to changes in output of pork between specified points as the marketing weight of hogs changes." The data are analyzed and discussed under the following headings: Feed consumption and output of live

weight, dressed weight, and edible product, with sections on chemical composition of the carcass and physical composition—input-output relationship; feed consumption and joint output of standardized pork and residual fat from a fixed number of hogs, and alternative output combinations of standardized pork and residual fat with a fixed feed supply; feed consumption and output of pork and fat taken separately; and meaning and interpretation of adjusted additional output. An appendix includes the formulas used in the analysis of the composition of the individual hog, the tables on which the charts in the bulletin are based, and the glossary of terms used in a more or less specialized sense. A bibliography is included.

Cost of producing sheep in southwestern Utah in 1945, D. A. BROADBENT (*Farm and Home Sci. [Utah Sta.]*, 7 (1946), No. 2, pp. 7–8, 16).—A table is included comparing the different expenses, receipts, and profits for breeding ewes 1939–41 and 1945. The data were obtained in a detailed study of 60 ranches for 1939–41 and 17 of the same ranches for 1945. The reasons for changes in the various items are discussed. The total expenses and receipts per ewe were \$5.55 and \$7.93 respectively in 1939–41 and \$10.70 and \$10.31 respectively in 1945.

Cost of producing butterfat in Utah, G. T. BLANCH and G. Q. BATEMAN. (Coop. U. S. D. A.). (*Farm and Home Sci. [Utah Sta.]*, 7 (1946), No. 2, pp. 6, 16, 17, 18–19).—A table is included and discussed comparing the costs per cow and per pound in producing butterfat in 1937–39 and the estimated costs in 1945. The 1937–39 costs were obtained in a study of 452 cost-of-production farms supplying milk to Ogden (E. S. R., 89, p. 737). The estimates for 1945 are based on farm prices of feed and labor from price reports of the U. S. D. A. Bureau of Agricultural Economics, and a study of 45 dairy farms in Summit County made by the Utah Agricultural Extension Service and other current general and economic data. Other tables show the amounts and costs per cow of different feeds fed during the two periods; the quantity of feeds normally required and the feed costs per pound of butterfat, and different levels of butterfat production per cow per year; the cost of man labor per pound of butterfat at varying levels of production, and costs of man labor per hour; and the production and feed costs for cows in Utah dairy herd improvement associations, 1944–45.

The net costs of producing butterfat per cow and per pound were \$107.16 and 42.4 ct., respectively in 1937–39 and \$219.20 and 82.7 ct. in 1945. Costs for feed per cow was \$51.58 and \$118.30, respectively, in the two periods and costs of man labor \$40.61 and \$81.00. The average number of man hours labor per cow and price per hour used were 163 hr. and 25 ct. in 1937–39, and 135 hr. and 60 ct. in 1945.

Economic aspects of canning peas in Wisconsin, W. W. WILCOX and J. B. BOWDITCH. (Coop. U. S. D. A.). (*Wisconsin Sta. Res. Bul.* 158 (1945), pp. 17+, illus. 4).—Two hundred and sixteen representative canning-pea growers in the eastern, Spencer-loam, and northwest areas of the State were interviewed regarding production practices, yields, costs, and returns; and 27 companies regarding services furnished growers, comparative yields and quality of company- and farmer-grown peas, and average returns of farmer growers. Analyses are made of the trends in acreages of canning peas in Wisconsin and the United States; the yields per acre in Wisconsin of peas, oats, and corn, 1919–45; the costs and returns, 1944, for canning peas in the three areas studied, with a table showing the physical and money costs; and the competitive position of canning peas and oats in the State. The factors important for high yields of peas, the reduction of feed production

due to growing of peas, canners' services to growers, company- v. farmer-grown peas, and the farmers' comments on the advantages and disadvantages of growing canning peas are discussed.

The average yields and net returns per acre, including return to land, in the three areas were: Eastern, 1,918 lb. and \$40.25; Spencer-loam, 1,661 lb. and \$22.80; and northwest, 1,414 lb. and \$21.15. In each area the farmers with the highest yields found canning peas a profitable crop, but those with yields below the average were usually dissatisfied with returns. Oat yields in all sections during 1939-43 would have had to be about 30 bu. per acre higher to equal the returns obtained from canning peas. The yields of oats required to equal the returns from 1,200- to 2,400-lb. yields of peas were 37 to 38, and 108 to 110 bu., respectively.

A credit study on 167 tobacco farms, Puerto Rico, 1939-40, J. O. MORALES and S. L. DESCARTES (*Puerto Rico Univ. Sta. Bul.* 69 (1946), pp. 54+, *illus.* 2; *Span. abs.*, pp. 52-54).—The study is based on records for 167 farms taken in the intensive tobacco producing area of Puerto Rico. Additional information was obtained from 21 lending agencies. Analyses are made of the financial conditions of the farmers; the amounts and sources of long-time credit; and of short-time loans for production of tobacco and other purposes, and the purposes for which the loans were used. The number of months the loans were outstanding, the seasonal distribution of loans, the collateral required, the methods of charging interest, the credit costs, and the attitude of borrowers toward the lenders are discussed. Analyses are made of the amount advanced per cuerda, per hundred-weight of tobacco, and per value of crop; the relation between credit advanced per cuerda and size of business, and yield per cuerda; between amount advanced and value of crop and size of the tobacco plantings; and between cuerda of tobacco to the amount advanced per cuerda.

The average assets of the farmers were \$3,707, and the average liabilities on June 30, 1940, were \$1,251, consisting of mortgages averaging \$549, production credit \$488, store credit \$65, other liabilities \$147, and unpaid balances on preview production loans \$2. Forty-nine of the farms were mortgaged, the average mortgage being \$1,667. Twenty-seven of the loans were from the Federal Land Bank and Land Bank Commissioner and 21 from individuals. There were 321 short-term loans, totaling \$97,017, of which amount 86 percent was for tobacco production, 6 percent for other crops, and 8 percent for personal accounts. Of the 185 loans totaling \$83,386 for tobacco production costs, 80 totaling \$63,144 were made by dealer-lenders. Loans were outstanding an average of 9.4 mo. The tobacco production credit outstanding at the time of liquidation constituted 73 percent of the value of the crop. Other short-term personal debts brought the total borrowings to 80 percent of the value of the crop.

Price tendencies in farm land of high and low productivity (*Ohio Sta. Bul.* 659 (1945), pp. 12-13, *illus.* 1).—This analysis covering more than 1,700 tracts of farm real estate sold in the period of January 1941 to July 1944 depicts the tendency in an inflationary period for the price of land of low-productive capacity to advance relatively faster than the price of land of high-productive capacity. That this tendency existed during the last period of rising land prices has been emphasized by the observation that the majority of farms involved in financial distress during the late 1920's and early 1930's were lands of poor productive capacity purchased a few years previously when prices were inflated. The general level of farm real estate prices in Ohio advanced from an index value of 80 as of March 1941 to 111 in

March 1944, a change of 39 percent. As indicated by this study, there was a price advance of 28 percent for the better and of 58 percent for the poorer lands.

Farming systems and practices, red soil area, Eastern Highland Rim, Tennessee, 1944. S. W. ATKINS and C. C. MANTLE (*Tennessee Sta., Agr. Econ. and Rural Sociol. Dept. Monog. 200 (1946), pp. 58+, illus. 4*).—"The primary purpose of this report is to make available information on land use, systems of farming, sizes of farms, crop and livestock management, and other related data describing important phases of the agriculture of this area." Information was obtained largely through interviews regarding 84 commercial and 25 semicommercial (self-sufficing and part-time) farms in Putnam, White, and Warren Counties. In the analysis the commercial farms are grouped as general, dairy, and beef farms, and also on the basis of size.

[Economic land classification in Virginia counties] (*Virginia Sta. Buls. 391 (1946), pp. 10, illus. 1; 392, pp. 8, illus. 1*).—These bulletins continue the series (E. S. R., 95, p. 582). The counties covered are: Bulletin 391, Hanover, by G. W. Patteson and A. J. Harris; and 392, Grayson, by G. W. Patteson and Z. M. K. Fulton, Jr.

Long-time adjustments in forage land utilization in the northeast region. V. L. HURLBURT. (U. S. D. A.). (*Jour. Farm Econ., 28 (1946), No. 2, pp. 476-494, illus. 4*).—"The purpose of this report is to analyze from the standpoint of land requirements the direction and the nature of the adjustments that appear imminent, rather than to determine the most desirable level of production for the region." The region studied included the New England States and New York, Pennsylvania, New Jersey, Delaware, and Maryland. The problem situation in and economic aspects of forage land utilization and the significance of the adjustments to the land economy are discussed.

The economy of small farms in Wisconsin. W. W. WILCOX. (Univ. Wis.). (*Jour. Farm Econ., 28 (1946), No. 2, pp. 458-475, illus. 3*).—The study is based on a sample of 150 farms with 20 to 39 acres, and of 150 with 40 to 59 acres of cropland in 25 townships representative of the better farm areas (eastern, western, and southern) of the State. Among the phases discussed are decline in farm numbers, 1936-44; productiveness of soils; intensiveness and diversification in use of croplands; use of labor saving machinery; buildings; incomes earned and causes of variations; the human side of small farms; family characteristics; the financial situation; and occupational experience and plans of the small farm operators.

Labor saving through farm job analysis.—II, Hay harvesting. R. M. CARTER (*Vermont Sta. Bul. 531 (1946), pp. 52, illus. 19*).—This is a study of the time used in performing different operations in the jobs of cutting, raking, bunching, loading, hauling to storage, unloading, and mowing away hay with different types of equipment and power. It is based on observations on approximately 140 commercial dairy farms visited in 1944 and 1945. On about half of the farms detailed time studies were made of all observed operations, roads and fields were measured, and the hay handled was weighed. Charts show for the individual farms the time required for different operations in doing the different jobs in handling 1 ton of hay, using different methods and types of equipment and power. Tables accompanying the charts show for each job and operation the average time required and the time required on the farms using the least and the most time. The facts presented in the charts and tables are discussed. "The facts presented are not intended in any way to indicate general averages, but rather a summary record of ob-

servations made at given times and places." A section—the farm operator's problem—discusses the utilization of the data obtained in the study, job inter-relationships, job-method combinations, the importance of farm equipment, and the importance of knowing how to do a job. Appendixes analyze the average, the highest, and the lowest time costs in getting 500 lb. of hay out of the mow and feeding it; give estimates of costs of farm equipment required for various job-method combinations; and describe the construction and operating costs of a buck rake built and operated by the station, and the two-piece hay racks in use in the State.

This study continues the series (E. S. R., 90, p. 262).

Marketing the 1944 Wyoming wool clip under the Commodity Credit Corporation Purchase Plan, J. L. VAN HORN and H. H. HULBERT (*U. S. Dept. Agr., Farm Credit Admin., Misc. Rpt. 98 (1946), pp. 29 +, illus. 1*).—Under Food Distribution Order 50, effective April 25, 1943, the Commodity Credit Corporation became the sole purchaser of all domestically produced wool, and was authorized to purchase the domestic clip at the ceiling prices established by the Office of Price Administration in the fall of 1942. The administration of the purchase program by the Corporation is described. Tables are included and discussed for the 1944 Wyoming wool clip, showing among other items, the types of sales, grades and types of wool, distribution of the volume by areas of the State and grades, gross ranch prices, handling charges, sales results by area and grade, shrinkage and yield by grades, tonnage received by handlers, and similar items.

Causes of changes in the price of potatoes, G. E. BRANDOW (*Pennsylvania Sta., Jour. Ser. Paper 1331 (1946), pp. 23 +, illus. 9*).—The period considered is from 1921, when the price collapse following World War I had halted, to 1940, the year before the United States entered World War II. The general price level and the price of potatoes; the relation of potato supply to price; the explained and unexplained changes in the price of potatoes from year to year; seasonal variation in potato prices; the demand for potatoes; and the margins between prices received by farmers and paid by consumers are analyzed and discussed. Potato prices in the postwar period are briefly discussed.

Wholesale marketing of Irish potatoes in Knoxville, Tennessee, B. H. LUEBKE and C. C. MANTLE (*Tennessee Sta., Agr. Econ. and Rural Sociol. Dept. Monog. 199 (1946), pp. 29 +, illus. 16*).—Among the subjects discussed are: The volume, total and seasonal, of potatoes handled by wholesale dealers; the origin, total and seasonal, of the potatoes; seasonal variation in volume handled; origin of truck receipts; varieties and grades handled; method of buying; average and seasonal wholesale prices; storage by wholesalers; and the wholesale margin in handling.

Retailing and consumption of Irish potatoes in Knoxville, B. H. LUEBKE and C. C. MANTLE (*Tennessee Sta., Agr. Econ. and Rural Sociol. Dept. Monog. 201 (1946), pp. 21 +, illus. 4*).—Part 1, retailing of potatoes (pp. 1-8), is based on data obtained from a sample of 20 grocery stores and covers annual sales; frequency, size, and channels of purchases; consumers' preferences as to varieties; price mark-up by stores; seasonal consumption; etc. Part 2, consumption of Irish potatoes by food establishments (pp. 8-15), is based on a sample of 40 of the approximately 175 public and semipublic places where food is served in the city. Annual purchases; source, frequency, and size of purchases; varieties served; variety preferences for different preparations; substitutes, etc., are discussed.

The fall shortage of milk: A problem in price adjustment, L. SPENCER and H. A. LUKE ([*New York*] *Cornell Sta.*, A. E. 550 (1946), pp. 31+, *illus.* 6).—The fall shortage of milk, especially in New York State, the factors that are responsible for the shortage, the seasonal pattern of milk production, price incentives for fall production and ways of producing such incentives, etc., are discussed. Proposed adjustments for the period April 1946 to June 1947 are suggested in the prices of dairy products and in butterfat subsidy payments on a national basis, and in the prices of fluid milk and cream in the New York milkshed, and comparisons are made with the period April 1945 to June 1946.

Should cheese be priced on a solids and butterfat basis? W. V. PRICE and A. B. EREKSON (*Natl. Butter and Cheese Jour.*, 37 (1946), No. 7, pp. 40, 41, 86, 88, 90–92).—These two articles discuss the problems of pricing cheese. Each approaches the subject in a different way. The article by Price (pp. 40, 86, 88) (Univ. Wis.) includes a general formula for the “fat and dry basis” price by which tables can be built up to show the value of any cheese on the “fat and dry basis” for any combination of butter and cheese prices. The article by Erekson (pp. 41, 90–92) presents three methods for calculating the increased value of high fat cheese.

Apple quality and its effect on price and rate of sale, G. E. BLANCH ([*New York*] *Cornell Sta. Bul.* 826 (1946), pp. 50, *illus.* 5).—Data were obtained on 401 lots of apples at the G. L. F. Mid-Hudson Fruit Auction at Milton, N. Y., from September 17 to October 2, 1942, and 303 lots offered for sale in 112 retail stores in Syracuse and Buffalo, N. Y., between October 1942 and January 1943. Data from the auction sales are analyzed and discussed under the headings: Variation in price and reasons for price differences—variety, size, grade, and quality defects; and those for the retail store sales under the following headings: Types of influence of quality factors; variations in price and rate of sale; factors affecting price and rate of sale—“store characteristics” and elements of quality; retail margins; and source of supply. The adequacy of grade standards is also discussed.

In the auction study, the average price paid for the varieties studied (McIntosh, Cortland, Rhode Island Greening, and Northern Spy) was 71 ct. per bushel, the total range being from 20 ct. to \$1.70. A premium (net) of 30 ct. per bushel was paid for good color over poor color. The most seriously bruised lots were discounted 28 ct. per bushel over the least affected lots. Lots most seriously affected by apple scab were discounted 23 ct. per bushel over lots free of fungus. Red bug injury where abundant decreased the price 24 ct. per bushel. The price differential between lots free from codling moth stings and the most seriously affected lots was 21 ct. per bushel. Stage of maturity, except for apples reaching the ripe stage, did not have an important effect on price. “As the number of defects increased, prices decreased regularly (disregarding the fact that some defects have a greater influence on price than do others). Over the entire range from 2.4 to 8.5 defects, the decrease in price averaged 8 1/3 ct. per defect.”

The price of apples at the time of visit to the retail stores varied from 2 to 15 ct. per pound, averaging 6.2 ct. The daily rate of sale from individual lots varied from 0 to 300 lb. An average of slightly more than 1/2 bu. was sold per lot. Increase in size of store, as measured by sale of a selected group of products, caused apple sales to increase rapidly but not in proportion to the increase in size of store. McIntosh, Cortland, Northern Spy, Rhode Island Greening, and local Delicious were the fastest-selling and highest-priced varieties. “The third of the lots with the best color was 11 percent higher

in price than the third with the poorest color, but the rate of sale was double. The total premium for best color was about the same as at the auction. . . . The least clean lots were priced 0.8 ct. per pound lower than the clean lots, and the rate of sale was 10 lb. less. No lot offered for sale was free of bruised fruit. The influence of this defect was primarily on rate of sale, for retailers did not reduce price as the fruit become more bruised after entering the store." Lots seriously affected with apple scab were discounted 0.8 ct. per pound and the rate of sale depressed 1/3 bu. per day. When decay was encountered the selling price was reduced 1/3 ct. per pound and the rate of sale about 35 percent. "Fruit loses condition when in a store at relatively high temperatures and low humidity. The surface eventually becomes wrinkled and the flesh spongy, a condition commonly called shrivel. This condition reduced price somewhat. It reduced the rate of sale by a large amount that became increasingly serious from day to day." The retailers' average margin was 38 percent of the retail price, or approximately 2.3 ct. per pound. Retailers tended to add about the same mark-up in cents regardless of the amount paid for the fruit.

Postwar purchase and improvement plans of farmers, A. M. AHALT, S. H. DEVAULT, and L. E. FLESCII (*Maryland Sta. Bul. A40 (1945), pp. 37-123 +, illus. 13*).—On the basis of records obtained by questionnaires and personal interviews covering 1,084 farms in six counties representative of the type-of-farming areas of the State, analyses are made of the estimated expenditures during the first two postwar years (1946 and 1947) for farm equipment, construction and repair of buildings, general service improvements (fencing, electricity, and water, heating, and sewage systems), and household equipment. Other analyses are made of the farmers' plans for financing the expenditures and of the postwar labor opportunities in the State. Analyses are made for the State as a whole, for each type-of-farming area, and by size-of-farm groups. The sample used included 9.9 percent of the 10,943 farms in the six counties with 10 acres or over, according to the U. S. Census of 1940. The estimated expenditures for the State are based on 36,610 farms that had 10 acres or over. Some of the findings were:

The estimated cost of purchases and improvements planned during the first two postwar years is \$72,670,000, or \$1,990 per farm of 10 or more acres. The estimated expenditures per farm for the four classes of improvements are: Farm equipment \$1,010, buildings \$750, general service \$110, and household equipment \$120. Approximately 32 percent of the farmers plan to purchase some type of motor vehicle, and about 30 percent plan to purchase a tractor. New construction and repair of dwellings will account for one-third of all anticipated building expenditures, with new dairy barns and repairs on old barns a close second to dwellings. Construction of new buildings will account for 70 percent and repairs for 30 percent of the building expenditures. Expenditures for fencing and electricity will be greater than for any of the other general service improvements. Refrigerators, bathroom fixtures, and washing machines are expected to account for 73 percent of the expenditures for household equipment. Estimated expenditures per farm range from \$1,455 to \$3,016 for the different type-of-farming areas, and from \$1,159 for farms of 10 to 49 acres to \$3,016 for farms of 180 or more acres. The farmers plan to finance 55 percent of the postwar expenditures from income earned during the immediate postwar period, 34 percent from accumulated savings, and 11 percent from loans. It is expected that 23,600 regular farm laborers will be employed in the postwar period, as compared with 18,200 in 1940 and 11,900 in 1944. The number of family workers, exclusive

of operators, decreased from 26,400 in 1940 to 25,300 in 1944. A total of 9,400 farms are operated with the help of farmers' sons. Approximately 4,700 farmers were planning to enter into sharing or partnership arrangements with their sons if they returned to the farm after the war.

RURAL SOCIOLOGY

War relocation of subsistence farmers (*Ohio Sta. Bul.* 659 (1945), p. 12).—From November 1942 through March 1943 the U. S. D. A. Farm Security Administration, in cooperation with the U. S. Employment Service and the Ohio State University, aided in the relocation of workers and their families from comparatively unproductive farms in eastern Kentucky to Ohio for training and placement as farm laborers. Of the 316 workers transported from Kentucky to Ohio who were included in the study, 214 were hired by Ohio farmers. In August 1943, 5 to 9 mo. after their employment, it was found that only 101 remained in their original farm jobs in Ohio. The majority of these who moved went back to Kentucky or into some nonfarm employment. It was found that the relocation of people from the hills of Kentucky to the commercial and mechanized farming areas of Ohio involved the workers and their families in difficult problems of personal and social adjustment. The workers most successful in making the readjustment included those in the age range of 20-40 yr. who had had at least eight grades of schooling.

Farmer co-operation to meet emergency labor needs during the war years, S. T. KIMBALL (*Michigan Sta. Quart. Bul.*, 28 (1946), No. 4, pp. 320-325).—The author tells how the farm labor problem was met in Shiawassee County, Mich., during the war years.

American cooperation, 1942-1945 (*Philadelphia: Amer. Inst. Coop.*, 1945, pp. 432+).—This is an extensive collection of papers summarizing the problems of farm cooperatives during the war period and how they were met.

Twelve out of every 100 farm youths not enrolled in school: Rural schools face a major problem, S. C. MAYO (*Res. and Farming [North Carolina Sta.]*, 4 (1946), *Prog. Rpt.* 3, pp. 5-6, 10, illus. 2).—At the time of the 1940 census there were in North Carolina 76,327 young people 8-16 yr. of age out of school. Twelve percent, a larger proportion than in any other residence class, of each 100 farm boys and girls were not associated with the school system, and rural areas had more than their proportionate share of these out-of-school youths. Rural-farm areas of the State were especially heavily weighted—52.9 percent of the population 8-16 yr. of age were living on farms, but 59 percent of the out-of-school youths were on farms, including 13.8 percent of the boys and 9.8 percent of the girls. The proportion of nonwhite youth out of school was larger than in the white in all residence classes, but in rural-farm areas it included 16.4 percent of the nonwhite boys 8-16 yr. on farms. At age 16, half of the rural farm nonwhite boys were in school and half were out.

[Studies of health and human resources in Ohio] (*Ohio Sta. Bul.* 659 (1945), pp. 13-14).—Death rates among infants, children, youths, and very old people were generally higher in rural areas than in the cities where health services and facilities are more adequate. Death rates were highest of all in the economically and socially disadvantaged rural areas. Doctors, dentists, and hospitals, as well as other health services and facilities, were heavily concentrated in the large cities and were least adequate where levels of living were lowest. Before the war, the Ohio counties with the eight largest cities had 160 doctors, 70 dentists, and 383 general hospital beds for

each 100,000 of the population. The remainder of the State, including most of the rural population, had only 91 doctors, 39 dentists, and 159 general hospital beds per 100,000 people. The most disadvantaged rural area in Ohio had only 75 doctors, 31 dentists, and 113 general hospital beds per 100,000 people. A much larger proportion of rural than of urban doctors and dentists were aged men who had passed the peak of their efficiency as practitioners.

The development and financing of local governmental institutions in nine Vermont towns. R. M. CARTER (*Vermont Sta. Bul.* 529 (1946), pp. 66+, *illus.* 13).—This is the second in a series of four bulletins covering the land use and local institutions in nine of the commercial agricultural towns in Vermont (E. S. R., 94, p. 824). Governmental institutions in nine Vermont towns were analyzed for a 12-mo. period to determine local geographic sources of incomes and allocations of expenditures, mainly for the year 1939. Over 80 percent of the tax base in these towns was made up of real estate, more than half of which was within village limits. In the open country, property values per square mile declined from land class to land class. While total maintenance costs for all highways are divided about equally between town and State, local officials have responsibility for disbursing about two-thirds of all funds. For the towns as a whole, taxes raised on village property were used to support highways in rural areas, expenses in every land class being greater than average taxes assessed for that purpose. A few large schools provided for the needs of the villages, while many small, and sometimes inadequate, schools were required for rural children. The proportion of rural families needing relief was related to average physical conditions within a land class, ranging from 1 percent of all families in land class 1, to 12 percent in land class 4. The major demand for assistance, however, was from village families. When taxes collected were allocated to the various areas on the basis of their needs, indications were that villages required about 52 percent of the total; land class 2, 24 percent; land class 1, 12 percent; land class 3, 10 percent; and land class 4, 2 percent. Indebtedness amounted to \$40 on each \$1,000 of assessed valuation, or approximately one year's tax revenue at the current rate. The tax resources of the villages are sufficient to meet the costs of these services and also to provide a small margin for use in rural areas. In the open country, only in land class 1 is revenue collected in excess of outlays.

Postwar revenues for rural public services in Maryland. W. P. WALKER and S. H. DEVAULT (*Maryland Sta. Bul.* A41 (1946), pp. 125-154+, *illus.* 3).—The purposes of this study were to examine the adequacy of State and local tax resources; to review basic principles and policies underlying tax support of major rural governmental services; and to suggest changes in law or policy which will produce more equitable taxation and result in more comparable public services for rural people. The basic data were obtained from reports of the Comptroller of Maryland, Maryland State Tax Commission, State Department of Education, State Roads Commission, State Board of Welfare, Boards of County Commissioners, U. S. Bureau of Internal Revenue, and U. S. Bureau of the Census. The first section describes the services and amounts of the tax revenues of the State and the different counties. The second part—Modification of Tax Structure—calls attention to the tax procedure in State income taxation and property taxation, "which seems inconsistent with other declared State policies and which produces inequalities in tax burdens, with special reference to income and property taxation and rural public services." The third section—Functional Aspects of Tax Rev-

enue System—discusses the three governmental functions—public education, county roads, and public welfare—which account for the major part of State and local expenditures, and how “their proper support depends upon a State policy which results in balancing the needs of each and levying and distributing equitable taxes for their support.”

A case study in township zoning, S. T. KIMBALL (*Michigan Sta. Quart. Bul.*, 28 (1946), No. 4, pp. 253–269).—This is an analysis of objections to zoning in a suburban residential neighborhood.

AGRICULTURAL AND HOME ECONOMICS EDUCATION

Report of cooperative extension work in agriculture and home economics, 1945, M. L. WILSON (*U. S. Dept. Agr., Ext. Serv. Rpt.*, 1946, pp. 43).—This annual report (E. S. R., 93, p. 93) of the Director of the Extension Service for the year ended June 30, 1945, deals briefly with the activities in different fields of about 9,000 extension workers. The usual statistics are included as to the number of counties with county extension agents, sources of funds, and expenditures in the different States, Alaska, Hawaii, and Puerto Rico.

Teaching grade labeling, J. V. COLES. (Calif. Expt. Sta.). (*Jour. Home Econ.*, 38 (1946), No. 4, pp. 211–212).—This paper points out pertinent points for impartially presenting grade labeling to consumer or student groups. The study of grade labeling may be satisfactorily approached as a problem itself, or in connection with different groups of commodities. It involves a study of how it affects consumers, producers, and distributors, including its relation to and its effects on brands and advertising.

FOODS — HUMAN NUTRITION

Foods used by Filipinos in Hawaii, C. D. MILLER, L. LOUIS, and K. YANAZAWA (*Hawaii Sta. Bul.* 98 (1946), pp. 80, illus. 17).—This well illustrated bulletin, written primarily for the use of teachers, extension agents, public health nurses, dietitians, and others interested in the welfare of Filipinos in Hawaii, is based chiefly upon a study of foods and dietary habits of Filipinos whose incomes are low, but its dietary and food expenditure recommendations should also apply to those financially well situated. Brief discussion is devoted to the emigration of various dialect groups from the Philippines to Hawaii and their present distribution in the Territory, and to a comparison of the diet and health of Filipinos in the Philippines and in Hawaii. Detailed consideration is given to 22 food products much used by Filipinos in Hawaii, their use and nutritive value being discussed and data on their proximate mineral (Ca, P, Fe) and vitamin (vitamin A, thiamine, ascorbic acid) content being reported. Other foods used by the Filipinos are listed, and the place of rice, corn, and wheat in the Filipino diet is considered. Recommendations for improving the diet of the Filipinos in Hawaii are given, and Filipino methods of food preparation are suggested by the recipes presented for the use of the various foods analyzed. A short technical section describes the preparation of the samples and the methods of chemical analyses and vitamin assays employed. There are 59 literature citations.

Ways to use vegetables in Hawaii, H. Y. LIND, M. L. BARTOW, and C. D. MILLER (*Hawaii Sta. Bul.* 97 (1946), pp. 110).—This bulletin, planned especially for the homemaker, gives simple and concise directions based on the findings of recent scientific research for the selection and preparation of

about 40 vegetables available in Hawaii. Concerning each vegetable there are notes on nutritive values, points to consider in selection, recipes for preparing in a number of appetizing ways, and specific directions for preserving the maximum nutritive value. A brief discussion on the contribution which vegetables in general make to the well-planned diet, the general principles involved in storing and cooking vegetables, and the selection and care of utensils used in vegetable cookery precede the sections which include recipes. A convenient tabulation shows which vegetables are to be regarded as excellent, good, fair, and poor sources of vitamin A, thiamine, and ascorbic acid; the classification is based on the vitamin values of the cooked vegetables, except in the case of cucumbers, lettuce, tomatoes, and water cress.

Organoleptic tests pertaining to apples and pears, W. D. BATEN. (Mich. Expt. Sta.). (*Food Res.*, 11 (1946), No. 1, pp. 84-94, illus. 2; abs. in *Mich. Sta. Quart. Bul.*, 28 (1946), No. 4, p. 361).—Tests were made on Delicious and Grimes Golden varieties of apples held in cold storage at 33° F., room temperature (72°), and at various times of the day. Judges scored the apples on the basis of their desirability and juiciness. The author summarizes the findings: "This study has shown that the average mature person likes cold apples and pears better than those served at room temperature. The average mature person also believes that fruits held at 33° are juicier than similar fruits held at about 72°. A large majority of layman judges are consistent in their decisions concerning desirability of the fruits examined. . . . Cold fruits of inferior quality are considered by the average person to be about as good, if not better than, fruits of superior quality at room temperature. One time of the day is about as good as any other time for testing apples."

Ascorbic acid prevents frozen peaches from browning, J. G. WOODROOF (*Georgia Sta. Press Bul.* 567 (1946), p. [1]).—This mimeographed report presents two home formulas and two commercial formulas for packing Elberta peaches for freezing. Ascorbic acid is recommended for preventing browning, and citric acid is suggested for stabilizing the ascorbic acid. Lemon juice may be substituted for the citric acid, serving also to enhance the color and flavor of the peaches.

Community canning centers (*U. S. Dept. Agr., Misc. Pub.* 544, rev. (1946), pp. 86+, illus. 66).—This publication, a revision of an earlier edition (*E. S. R.*, 91, p. 355), provides an additional section on the establishment and operation of small canning centers using gas burners. Slight modifications are made in some of the technics described earlier in order to conform with State laws on food, safety, health, and sanitation.

Changing pattern of food preparation of small town families in Mississippi, D. DICKINS (*Mississippi Sta. Bul.* 415 (1945), pp. 51+).—This study of changing food preparation practices and of the factors underlying these changes was based on data gathered by personal interviews with 1,158 white and Negro families living in four small Mississippi towns, two in the Delta and two in the Short Leaf Pine area. A study of the findings reported in detail in this bulletin indicated wide variation between white and Negro families in use and preparation practices; it appeared also that variations in towns of different soil areas were due in some part to differences in home food production programs but more to differences in socioeconomic status of the families as indicated by differences in monthly rent or rental value.

One method used in studying changes in food preparation involved a study of new dishes tried during the year. Among the white families, those in the intermediate housing groups (\$7.51 to \$20.00 and \$20.01 to \$40.00 monthly rental value) tried new dishes more often and averaged more new dishes than

those in the very low or the high rental groups. Of the total number of new dishes tried, relatively more of those tried in families of lower housing value were desserts than in the case of those tried in higher housing value families; the latter group tried relatively more salads than did the former group. Thirteen percent of all the new dishes tried were also new foods. Eighteen percent of the new foods tried were rated as poor or fair, while only 3 percent of the new combinations of familiar foods were thus rated. Sixty percent of the dishes receiving fair or poor rating were vegetable dishes. New dishes were tried most often upon the recommendation of friends, although homemakers in the higher housing value groups sometimes tried recipes from magazines, newspapers, and cookbooks; in the lower housing value groups advertisements were relatively more often the source of new recipe suggestions. Suggestions for new dishes tried by the Negro woman often came from the white woman.

Another approach to the study of changing food preparation patterns was through comparison of the methods of preparing 12 commonly used foods in the family and in the parental home. With the exception of cooked cabbage and slaw, it was found that the majority of the homemakers in all groups prepared these foods as they had learned to do in the parental home. Families of higher housing values made relatively more changes than families of lower housing values. Negro families made somewhat fewer changes than white families. In most cases, change in the method of preparation was attributed to family preference.

Findings of the study suggest (1) that any improved practices in food preparation will be brought about through the recommendation of friends or local leaders who could recommend adoption of new practices on the basis of their own personal experience; (2) that recommended changes in preparation practices must result in palatable foods acceptable to the family members; (3) that improved practices must be introduced through application to familiar rather than new foods; (4) that better time scheduling and change in tastes perpetuated since childhood must be stressed in attempts to introduce shorter cooking times for improved vegetable cookery; (5) that home economists who attempt to influence the food preparation pattern of families in the community need to cooperate with local groups and should cooperate with food and equipment manufacturers, advertising agencies, and publishers of women's magazines in order to assure technically sound suggestions from these sources; and (6) that home economists should cash in on good changes wrought by the war in perpetuating improved practices in food preparation.

Simple meals are time savers. D. DICKINS (*Miss. Farm Res. [Mississippi Sta.]*, 9 (1946), No. 2, p. 2).—This is a report of 80 white and 80 Negro homemakers' records, which shows the relationship of the number of dishes served at breakfast, dinner, supper, and the average time spent in preparation and clearing away the meals. When the number of dishes served was the same, there was little difference in time expenditures in clearing away in white and Negro groups, but time expenditures in preparation were greater for the Negroes, due probably to their poorer facilities for food preparation.

The utilization of d-amino acids by man.—V, Histidine, A. A. ALBANESE, J. E. FRANKSTON, and V. IRBY (*Jour. Biol. Chem.*, 160 (1945), No. 2, pp. 441–447, *illus.* 2).—A detailed description is given of the colorimetric procedure used in the estimation of histidine in urine. Measurements are made of the intensity of the red color produced by the diazo test following the destruction of interfering phenols by acid permanganate.

Adult humans were fed 0.01 mole of *l*(-)-histidine·HCl·H₂O and *dl*-histidine·HCl·H₂O. Within 9 hr. after administration of the *dl*-histidine, a total excess of urinary histidine was excreted which was approximately equal to the amount of *d* component so ingested. Based on this observation and the optical activity of an isolated fraction of this excess histidine, the authors adduce that *d*(+)-histidine is poorly utilized by man.

The effect of dietary proteins and amino acids on liver fat, J. M. R. BEVERIDGE, C. C. LUCAS, and M. K. O'GRADY (*Jour. Biol. Chem.*, 160 (1945), No. 2, pp. 505-518, *illus.* 2).—Elaborating upon their previous studies (E. S. R., 93, p. 798), the authors have studied the lipotropic effects of various diets. Fourteen different high-fat (40 percent beef drippings) diets were studied. Casein and/or gelatin provided protein in amounts equal to 35 or 40 percent of the total diet. The casein content ranged from 10 to 40 percent. The methionine and cystine contents of all the diets were maintained constant. Other essential amino acids were added in varying concentrations to the test diets.

Tabulated results indicate that the apparently superior lipotropic effect of free methionine over an equal quantity bound in casein (at casein levels below 22 percent) was obliterated when the quantities of the essential amino acids in the two diets under comparison were made approximately equal. Thus the lipotropic effect of a diet is determined not only by its content of sulfur-containing amino acids but also by its adequacy in other respects.

The authors conclude that the lipotropic activity of a protein is determined not only by its methionine and cystine contents, but also by the nature and quantity of the sulfur-free essential amino acids in the protein. These amino acids act indirectly; through their well-known influence on growth and maintenance they influence the formation of new tissue, thus modifying the amount of methionine left available for lipotropic action.

"Some evidence is presented for the existence in casein of a lipotropic factor other than methionine. Indirect evidence suggests that tyrosine may be involved."

A discussion is presented analyzing the discrepancies which arose in previous attempts to account for the lipotropic effect of casein. Fifty-three references are cited.

The inability of human or beef globin to support normal hematopoiesis in the rat without added isoleucine, J. M. ORTEN, J. E. BOURQUE, and A. U. ORTEN (*Jour. Biol. Chem.*, 160 (1945), No. 2, pp. 435-440).—Rats were fed a synthetic diet containing casein (22.5 percent), purified human globin (19.6 percent), or beef globin (19.6 percent) as the sole source of protein. Both globins failed to support growth and normal hemoglobin formation.

Supplementation of either type of globin with isoleucine was sufficient to produce maintenance of a normal concentration of hemoglobin in the blood. Subsequent removal of isoleucine was followed by the development of a mild to severe anemia and death of the animal. These observations indicate that isoleucine is necessary for normal blood formation in the rat.

Corneal vascularization in rats on a tryptophane deficient diet, A. A. ALBANESE (*Science*, 101 (1945), No. 2633, p. 619).—On a tryptophan-deficient diet, weanling rats developed corneal vascularization and cataracts. Although this diet was considered adequate in riboflavin, additional supplements of riboflavin amounting to 120 γ per day were fed to a second group but no amelioration of the symptoms occurred.

The addition of tryptophan to the deficient diet resulted in rapid gain in weight, complete recovery from the corneal lesions, and partial disappear-

ance of the cataracts. Similar results occurred when the riboflavin supplements were discontinued in the second group and tryptophan supplementation was initiated.

Growth and lipotropism.—I. The dietary requirements of methionine, cystine, and choline, C. R. TREADWELL (*Jour. Biol. Chem.*, 160 (1945), No. 2, pp. 601-607).—Rats were fed a basal diet containing 40 percent lard, 15.4 percent casein (vitamin free), 3.2 percent arachin, 5 percent salt mixture, 2 percent Cellu flour, and 34.4 percent glucose. Supplements of the necessary vitamins were added. The methionine and cystine contents were 500 mg. and 100 mg. per 100 gm. diet, respectively. Varying amounts of methionine, cystine, and choline were then added to this basal diet.

Results showed that the total methionine requirement of rats receiving a choline-free diet was approximately 1,200 mg. per 100 gm. of diet. This total was differentiated into a growth requirement of 600 mg. and a lipotropic requirement of 600 mg.

Amounts of cystine greater than 100 mg. per 100 gm. of diet did not exhibit any effect on the growth rate or any antilipotropic activity; 600 mg. of cystine excited a slight lipotropic effect when the methionine content was 500 mg.

When the basal diet was supplemented with 100 or 200 mg. of choline per 100 gm. of diet, there was no significant change in the growth rate.

The rats' need for lipotropic factors may be met by choline, methionine, betaine, or other substances capable of donating methyl groups. When these substances are present in the diet, no methionine is required for lipotropism. If the diet lacks these other lipotropic factors, then the methionine needed for lipotropic action is a high proportion of the total methionine requirement.

The influence of age and diet on the lipid composition of the rat. H. H. WILLIAMS, H. GALBRAITH, M. KAUCHER, and I. G. MACY (*Jour. Biol. Chem.*, 161 (1945), No. 2, pp. 463-474).—Newborn rats and animals 15, 45, and 70 days old were assayed for their lipide constituents. The whole bodies of the rats were ground and dried and determination made of the following lipide fractions: Phospholipide (cephalin, lecithin, and sphingomyelin), free and combined cholesterol, cerebroside, and neutral fat. Experiments were also carried out using 22-day-old rats as controls and litter mates which had ingested 3,000 calories (in an average of 66 days) of an adequate high-fat or low-fat diet.

The importance of separating the lipides of the body into (1) neutral, or storage lipide, fat and (2) essential, or structural, lipide is stressed. Alterations in the essential lipide composition of the body during growth were not reflected in the changes occurring in total lipide composition; the latter reflected the variations in the neutral fat which composed the largest portion (50 to 90 percent) of the total fat.

The essential lipide pattern changed appreciably during growth and development. The concentrations of phospholipide and free cholesterol decreased, whereas those of cerebroside and cholesterol esters increased.

Diets in which 40 to 70 percent of the calories were derived from fat had no influence on the essential lipide composition of the body. A diet in which less than 10 percent of the calories was furnished by fat produced an apparently significant alteration. On the latter diet, the rats contained less cerebroside and free cholesterol and more esterified cholesterol.

The effect of growth on the lipid composition of rat tissues. H. H. WILLIAMS, H. GALBRAITH, M. KAUCHER, E. Z. MOYER, A. J. RICHARDS, and I. G. MACY (*Jour. Biol. Chem.*, 161 (1945), No. 2, pp. 475-484).—As part of the above

study, certain animals were sacrificed for a study of lipid distribution in the tissues (brain, heart, kidney, lung, testes, liver, thymus, spleen, and skeletal muscle). All of the tissues showed an increase in essential lipid content during growth, primarily due to an increase of phospholipide. The other components of the essential lipid, cerebrosides and cholesterol, varied independently, not only with respect to each other but also to the total.

In these experiments, the fundamental change in lipid composition common to all the tissues studied appeared to be a quantitative increase in cephalin concentration. Specific changes in the various organs during growth were an increase in cerebrosides in testes and in skeletal muscle and a decrease in cardiac muscle; a decrease in free cholesterol and sphingomyelin in both skeletal and cardiac muscle; and an increase in sphingomyelin in kidney, lung and spleen. All essential lipid components except lecithin and cholesterol esters showed a marked increase in the brain during growth.

The probable relationships of these changes in lipid composition and pattern among the various tissues to the structural and functional growth of the tissue are discussed.

The effect of tocopherol and of fat on the resistance of rats to anoxic anoxia, E. L. HOVE, K. HICKMAN, and P. L. HARRIS (*Arch. Biochem.*, 8 (1945), No. 3, pp. 395-404, illus. 1).—Various groups of rats previously maintained on a stock diet were fed a stock diet or vitamin E-deficient diets containing 0 to 12 percent lard. Anoxia was produced in the rats by gradual decompression for 15 min. to about 185 mm. Hg.

Results showed that natural mixed tocopherols given orally in physiological quantities to adult rats resulted in a time of survival to anoxic anoxia greater (+89 percent) than that of controls on a vitamin E-free, low fat diet. The effectiveness of tocopherol was decreased (to about +31 percent) when the diet contained fat at a 12 percent level.

Fat in the diet decreased survival time of rats under conditions of anoxia. This was thought to be due to a decrease in the animals' R. Q.

The injection of large single doses of *d*-α-tocopheryl phosphate greatly increased the time of survival to anoxia of guinea pigs on a rabbit chow diet, but had no effect on rats.

Influence of the calcium intake level upon the complete life cycle of the albino rat, H. L. CAMPBELL and H. C. SHERMAN (*Amer. Jour. Physiol.*, 144 (1945), No. 5, pp. 717-719).—Continuing the studies of Campbell et al. (*E. S. R.*, 92, p. 298) the life histories of 72 female and 48 male rats on each of three levels of calcium have been investigated. Calcium levels were 0.34, 0.48, and 0.64 percent of the air-dry food mixture fed. The basal diet was considered as optimal as possible in all other respects.

The data on number of young reared, duration of reproductive life, and length of life are tabulated. The authors conclude from the results obtained that, under the favorable dietary conditions of the experiment, "the three levels of calcium intake here studied resulted in essentially equally good records throughout the life histories of the experimental animals. Thus with a diet sufficiently good in other respects, the range of optimal calcium intake extended from 0.34 to at least 0.64 percent of the air-dry food mixture."

Factors influencing the destructive effects of acidic beverages on the teeth of white rats and hamsters, R. A. GORTNER, JR., J. S. RESTARSKI, J. G. BIERI, and C. M. MCCAY (*Arch. Biochem.*, 8 (1945), No. 3, pp. 405-414, illus. 4).—The studies of Restarski et al. (*E. S. R.*, 94, p. 271) have been confirmed and elaborated. Solutions of citric, lactic, phosphoric, and sulfuric acids at pH 2.6 were found to attack the teeth of rats in different degrees.

Citric and lactic acid solutions and a synthetic lemonade caused severe damage to lower molars and had little effect on the uppers.

The addition of 10 percent sucrose, glucose, or maltose increased the tooth-destructive properties of phosphoric acid solutions in vivo. Lactose, on the contrary, had no such effect. The decalcifying properties of citric, lactic and sulfuric acid solutions were not influenced by the addition of 10 percent sucrose.

Experiments with hamsters receiving citric acid solutions containing 1, 5, 10, and 20 p. p. m. of fluorine (as sodium fluoride) produced results comparable with those reported previously for the rat. In most instances, fluorine provided partial protection against tooth destruction by acid. The differential action of citric acid in vivo on the upper v. lower molars of rats was not observed in the hamster.

Studies in vitro on the decalcification of pulverized human enamel by various acids, both alone and in the presence of sucrose or saccharin, yielded results differing from those noted in vivo with the rat. Phosphoric acid-sucrose caused greater tooth destruction in vivo than did citric acid, but this situation was reversed in vitro. Also, in vitro sucrose failed to increase the decalcification of enamel by phosphoric acid. When fluoride was added to the acid solutions, however, the enamel solubility in vitro was lowered 14 to 30 percent.

The excretion of ascorbic acid and dehydroascorbic acid in sweat and urine under different environmental conditions, J. B. SHIELDS, B. C. JOHNSON, T. S. HAMILTON, and H. H. MITCHELL. (Univ. Ill.). (*Jour. Biol. Chem.*, 161 (1945), No. 1, pp. 351-356).—Four young adult male subjects were tested in a controlled environment with temperature and humidity so regulated as to provide comfortable, hot dry, and hot moist conditions. Ascorbic acid assays were made by the method of Roe and Kuether (E. S. R., 90, p. 297), as the indophenol method was found to give false results when rubber materials were used in collecting the sweat. Results showed that when no extra vitamin C was added to the diet, excretion of ascorbic acid and dehydroascorbic acid averaged, respectively, 33 γ and 34 γ per 100 cc. of sweat. After a dose of 500 mg. of ascorbic acid/day had been fed for 7 days, the ascorbic acid excretion became 0 in 3 out of 4 subjects, while the dehydroascorbic acid excretion averaged 107 γ /100 cc. sweat.

"The data indicate an increased skin excretion of dehydroascorbic acid following ascorbic acid dosage, and a decreased excretion of ascorbic acid. The average total 24 hr. excretion of dehydroascorbic acid varied from 0.8 mg. under 'comfortable' conditions to 2.7 mg. under conditions inducing profuse sweating throughout the day."

Urinary excretion of ascorbic acid on a constant ascorbic acid intake was markedly increased under hot moist environmental conditions as compared to either comfortable or to hot dry conditions.

The occurrence of inositol and of p-aminobenzoic acid in sweat, B. C. JOHNSON, H. H. MITCHELL, and T. S. HAMILTON. (Univ. Ill.). (*Jour. Biol. Chem.*, 161 (1945), No. 1, pp. 357-360).—The same hot moist and comfortable environmental conditions described above were used, and the sweat and urine of the subjects were assayed for inositol (I) and p-aminobenzoic (PAB) acid by microbiological methods.

The concentrations of I and PAB acid in sweat averaged, respectively, 21 and 0.24 γ /100 cc. Under comfortable and hot moist conditions, the average hourly excretion of I in sweat was 0.027 and 0.118 mg., respectively. Corresponding average urinary losses were 0.626 and 0.494 mg./hr.

The effect of environmental temperature and potassium iodide supplementation on the excretion of iodine by normal human subjects, H. SPECTOR, H. H. MITCHELL, and T. S. HAMILTON. (Univ. Ill.). (*Jour. Biol. Chem.*, 161 (1945), No. 1, pp. 137-143).—The micromethod of Spector and Hamilton (E. S. R., 94, p. 580) was used in estimating the iodine excretion. Under hot moist conditions (38.3° dry bulb, 69 percent relative humidity), the concentration of iodine in undiluted sweat was 0.95 γ per 100 cc. A 2-mg. dose of KI increased the average concentration to 3.18 γ per 100 cc., while 14 daily doses of 2 mg. of KI did not produce any significant additional increase.

Profuse sweating (averaging about 677 gm. per hour) increases dermal losses of iodine at high levels of iodine intake (2,200 γ per day, KI dosage), but at low levels (700 γ per day) no consistent change was observed. The effect of a sweating environment on urinary output of iodine was variable. No evidence was obtained that a sweating environment will increase iodine requirements.

At least three-fourths of the total iodine lost from the body was excreted through the urine. When the iodine intake was increased with KI supplementation, most of the increased excretion of iodine was found in the urine.

The fecal excretion of iodine was greater under hot moist than under comfortable conditions at high levels of iodine intake. No differences were apparent at the basal levels. Iodine dosage raised the fecal output of iodine significantly in a hot moist, but not in a comfortable, environment.

The effect of pantothenic acid dosage and environmental temperature and humidity upon the dermal and renal excretion of pantothenic acid, H. SPECTOR, T. S. HAMILTON, and H. H. MITCHELL. (Univ. Ill.). (*Jour. Biol. Chem.*, 161 (1945), No. 1, pp. 145-152).—Dermal excretions for a period of 8 hr. and urines for 24 hr. were collected from five young men under comfortable and under hot moist conditions, both with and without pantothenic acid dosage. These collections were analyzed for pantothenic acid by the method of Krehl et al. (E. S. R., 90, p. 727), with *Lactobacillus arabinosus* as the test organism.

Daily dosage with about 18 mg. of pantothenic acid did not alter the pantothenic acid concentration of undiluted sweat, which averaged 3.8 γ per 100 cc.

An increase in the relative humidity from 65 to 92 percent with a dry bulb temperature of about 32.22° C. produced an increase of 176 percent in the average net loss of body weight and a concomitant increase of 221 percent in the average dermal excretion of pantothenic acid.

On an unsupplemented diet the average dermal excretion of pantothenic acid was 5.1 γ per hour under comfortable conditions, but under hot moist conditions this was increased to 27.7 γ per hour. An increase in the urinary excretion of pantothenic acid was also noted under hot moist conditions, even though the volume of urine under these conditions was only about one-half to one-third of the volume under comfortable conditions. Under hot moist conditions 31 percent of an 18 mg. dose of pantothenic acid was recovered in the urine.

The combined urinary and dermal excretion of pantothenic acid under hot moist conditions on a normal diet averaged 5.66 mg. per day in 1 week and 3.84 mg. per day in another. This was 11.6 percent greater than the excretion under comfortable conditions. The authors conclude that the data suggest, but do not prove, that the total excretion of pantothenic acid in urine and sweat may be increased under conditions of profuse sweating induced by environmental conditions.

Nutritive value of canned foods.—[XIII], Influence of temperature and time of storage on vitamin contents, N. B. GUERRANT, M. G. VAVICH, and R. A. DUTCHER. (Pa. State Col.). (*Indus. and Engin. Chem.*, 37 (1945), No. 12, pp. 1240-1243, illus. 5).—Continuing this series, noted on page 623, the effect of storage on the vitamin content of tomato juice, green lima beans, and whole-kernel yellow corn has been studied at 30° to 110° F. over a 365-day period. The vitamin content of each food was affected adversely by prolonged storage at the higher temperatures. The amount of vitamins retained varied with the type of product and the particular vitamin. Both time and temperature affected the retention of ascorbic acid. When corn and lima beans were stored at higher temperatures for long periods, reducing substances were formed which interfered with ascorbic acid determinations unless special procedures were adopted. Temperature of storage had a limited effect on carotene retention but a marked effect on thiamine retention. Riboflavin retention was not seriously affected by any of the conditions employed. Pantothenic acid retention was affected adversely by both time and temperature of storage, the temperature effect being most significant. Storage at extremely high temperatures (110°) for relatively short periods resulted in marked losses of vitamins, especially ascorbic acid and thiamine. These data emphasize the necessity of storing canned foods under the most favorable conditions in order to retain maximum vitamin content. It is suggested that the vitamin content of canned foods can be preserved most effectively at storage temperatures ranging from just above the freezing point of the respective food to approximately 42°.

Studies on vitamin content of canned pineapple, A. J. HAAGEN-SMIT, A. G. R. STRICKLAND, C. E. P. JEFFREYS, and J. G. KIRCHNER (*Food Res.*, 11 (1946), No. 2, pp. 142-147).—Vitamin A (carotene), thiamine, riboflavin, ascorbic acid, pantothenic acid, and *p*-aminobenzoic acid were determined on five types of commercially canned pineapple. Vitamin A, thiamine, riboflavin, and ascorbic acid were assayed biologically as well as by recommended chemical or physicochemical procedures. The other vitamins were assayed microbiologically. Assays were made on winter- and summer-packed fruit, and on the solid and liquid portion of the content of the can, as well as on the fresh fruit.

Results showed lower values for vitamin A (approximately 50 percent) and thiamine (approximately 20 percent) in the winter-packed fruit, higher values (approximately 30 percent in the solid portion) for ascorbic acid and pantothenic acid in the winter-packed fruit, and no significant changes in riboflavin content due to seasonal variation.

Ascorbic acid values for fresh pineapple ranged from 70 to 142 International Units, with an average of 100 I. U./100 gm. Thiamine in fresh pineapple ranged from 25.3 to 42.0 I. U., with an average of 35 I. U./100 gm.

The effects of fertilizer treatments, curing, storage, and cooking on the carotene and ascorbic acid content of sweetpotatoes, M. SPEIRS, H. L. COCHRAN, W. J. PETERSON, F. W. SHERWOOD, and J. G. WEAVER (*Georgia and North Carolina Stas., South. Coop. Ser. Bul.* 3 (1945), pp. 31, illus. 1).—This bulletin, the third in a series of Southern cooperative bulletins (E. S. R., 93, p. 643), presents a detailed technical report on work conducted cooperatively by experiment station nutrition workers in Georgia and North Carolina. Materials and methods, including the growing of the crop from sweetpotato plants obtained from a common source, the harvesting of the crop, curing and storage of the roots, the cooking and sampling procedures, and the methods of chemical analysis and statistical analysis, are discussed in detail.

Experimental results, tabulated and discussed, indicate that "sweetpotatoes of the Unit I Porto Rico variety retained their original carotene content from time of harvest through curing and 6 mo. of storage under controlled conditions. A slight loss of carotene, 9.9 percent, occurred on boiling whole roots, and a greater loss, 23.9 percent, resulted from baking. The ascorbic acid content of this variety at harvest was reduced 17 percent by curing. A progressive loss of ascorbic acid, about 6 percent of the original content in a month, occurred during storage. Neither boiling nor baking whole sweetpotatoes caused any loss of ascorbic acid. Fertilization with various combinations of N, P, K, and Ca had relatively little effect on the moisture, carotene, or ascorbic acid content of this variety of sweetpotato. Significant variations in composition were found between individual sweetpotatoes and also between root, center, and stem transverse sections."

The antioxygenic synergism of tocopherol and rice bran extract in the preservation of carotene. R. M. TOMARELLI and P. GYORGY (*Jour. Biol. Chem.*, 161 (1945), No. 1, pp. 367-379, illus. 5).—Vitamin A-deficient rats were fed a suboptimum dose of carotene in linoleic acid. Certain groups received additional supplements of mixed tocopherols (T) in linoleic acid and/or a rice bran extract (RB). Rats fed carotene $\pm$ RB failed to gain weight and died in approximately 16-20 days. With the addition of T to the carotene supplements, the rats gained an average of 9.2 gm./week; in the presence of T + RB, the gain was 10.9 gm./week.

In vitro tests showed that carotene in linoleic acid is oxidized or destroyed within 24 hr. The addition of RB alone had no effect on this destruction. The addition of T alone extended the time required for 50 percent destruction of carotene to 2 days. With the addition of both RB and T, approximately 60 percent of the carotene remained after 8 days.

This same antioxidant synergistic effect was noted on solutions of carotene in cottonseed or soybean oil. While RB alone partially stabilized the solutions of carotene (due to the presence of natural tocopherol in these oils), the simultaneous addition of T and RB improved the stability of the carotene in both cottonseed and soybean oil.

The vitamin A activity of neo- β -carotene U and its steric rearrangement in the digestive tract of rats. A. R. KEMMERER and G. S. FRAPS. (*Tex. Expt. Sta.*). (*Jour. Biol. Chem.*, 161 (1945), No. 1, pp. 305-309).—Biological rat growth tests were carried out with samples of neo- β -carotene U extracted from alfalfa, or prepared by iodine catalyses of β -carotene. Results showed that the vitamin A activity of neo- β -carotene U approximated 25 percent of that of all trans- β -carotene.

Tests were made on the intestinal contents of the rats 6 hr. after administration of neo- β -carotene U, and on the rat feces. Results indicated that the vitamin A activity found was due to a steric rearrangement in the digestive tract of the rat of part of the neo- β -carotene U into β -carotene and neo- β -carotene B.

Preserve vitamin B₁ in lima beans. L. MCWHIRTER (*Miss. Farm Res. [Mississippi Sta.]*, 9 (1946), No. 2, p. 7).—This is a brief report of a study on the loss of vitamin B₁ during the cooking of Henderson Bush variety lima beans. The raw beans at the green stage of maturity contained 0.256 mg. of vitamin B₁ per 100 gm. of beans; when matured to the white (but not dry) stage of maturity, the raw beans contained 0.270 mg. per 100 gm. Cooking experiments in which the raw beans were slowly dropped into twice their weight of boiling water and cooked for 30 min. showed that the green limas lost only 2.3 percent of their original vitamin B₁ content but that the

mature white beans lost 17 percent during this cooking period; when the cooking period was extended to 3 hr. the losses were 41 and 37 percent, respectively.

The microbiological activity of dl-oxybiotin and related compounds, T. WINNICK, K. HOFMANN, F. J. PILGRIM, and A. E. AXELROD (*Jour. Biol. Chem.*, 161 (1945), No. 1, pp. 405-410, illus. 1).—The relative activity of dl-oxybiotin (in terms of d-biotin) was tested by comparing the amount required to produce half maximum growth of the following four organisms: (1) *Lactobacillus arabinosus*, (2) *L. casei*, (3) *Saccharomyces cerevisiae*, and (4) *Rhizobium trifolii*. On a percentage bases, the activity of dl-oxybiotin was 50, 40, 25, and 15 percent for the four organisms, respectively.

The hydrolysis of the urea ring in oxybiotin resulted in almost complete inactivation of the compound for *S. cerevisiae* and *L. arabinosus*. Replacement of the carboxyl group in oxybiotin by a primary alcohol group decreased the activity for these two organisms to 1/300 that of the parent substance.

Inhibition experiments with avidin demonstrate that oxybiotin, its methyl ester, and its pentanol derivative all combined with avidin in approximately the same molecular proportions as does biotin. The diamino derivative of oxybiotin was not inhibited by avidin.

Human biotin metabolism on various levels of biotin intake, J. GARDNER, H. T. PARSONS, and W. H. PETERSON. (Wis. Expt. Sta.). (*Arch. Biochem.*, 8 (1945), No. 3, pp. 339-348).—Studies were made of the biotin metabolism of 10 college women who consumed a low-, moderate-, and high-biotin diet, and the moderate diet supplemented with 50 γ and 100 γ of biotin as the methyl ester. These diets contained from 9 γ to 171 γ of biotin daily.

An increase in dietary biotin intake from 9 γ to 33 γ failed to cause a rise in urinary biotin, but the fecal biotin increased 40 percent. When 171 γ of dietary biotin were ingested, the urinary biotin increased to more than 5 times that excreted on the low- or moderate-biotin diet, while the fecal biotin increased 80 percent over that of the low-biotin diet.

Total biotin output averaged 9, 3, and 1.5 times the dietary intake for the low-, moderate-, and high-biotin diets, respectively, indicating biotin synthesis with relatively less synthesis taking place on the high-biotin diet.

When 50 γ of biotin were added to the moderate-biotin diet, a maximum of 30 percent of the additional biotin was accounted for in the urine. This occurred on the third or fourth day after the beginning of the biotin feeding.

When 100 γ of biotin were ingested, a maximum of 72 percent was accounted for in the urine. The rise in excretion continued for the entire 6 days of higher intake. No change in fecal biotin occurred when either 50 γ or 100 γ biotin were fed. The water-soluble biotin in dried feces varied from 2-15 percent of the fecal biotin. An increase in measurable biotin occurred when a water extract of feces was acid hydrolyzed.

Twenty-five or 50 γ of biotin given with breakfast and dinner were excreted promptly, a large portion of the additional biotin being found in the urine within 6 hr. after ingestion.

Nutritive value of fish from Michigan waters.—I, Nicotinic acid of lake herring, carp, common suckers, and burbot, J. F. KLOCKE, T. PORTER, P. I. TACK, E. LEFFLER, N. S. HENRY, and R. NITCHALS. (Mich. Expt. Sta.). (*Food Res.*, 11 (1946), No. 2, pp. 179-186).—Lake herring (*Leucichthys arctedi*), common suckers (*Catostomus c. commersoni*), carp (*Cyprinus carpio*), and burbot (*Lota lota maculosa*) were assayed at different seasons of the year over a 2-yr. period. Assays were made on fresh, frozen, smoked, and baked samples. A modification of the chemical method of Dann and Handler

(E. S. R., 87, p. 14) was used for the determination of nicotinic acid. Preliminary extraction studies with various enzyme preparations (takadiastase and papain, and polidase) as well as concentrated acid or alkali digestion indicated the best results were obtained by digesting with polidase at pH 7.0 for 16-18 hr. at 45° C.

The results are tabulated and show that lake herring from Saginaw Bay had an average of 55, 31, and 23 μ g. of nicotinic acid per gram of tissue in November 1943 and June and November 1944, respectively. Green Bay herring contained an average of 27 μ g. per gram in February and 23 μ g. per gram in June and November. The highly significant differences in nicotinic acid content could only be explained by the effect of seasonal or environmental conditions.

Common suckers contained an average of 13 and 11 μ g. of nicotinic acid per gram of tissue in March and October, respectively. In May and October carp had 15 μ g. per gram, burbot averaged 16 μ g. per gram, carp roe had values of 13 μ g. of nicotinic acid per gram, while herring roe contained 6 μ g. per gram. Wide individual variation occurred in each species studied.

Freezing and subsequent storage for 2½ to 3 mo. caused insignificant loss of nicotinic acid in carp, common suckers, and two groups of lake herring. Herring analyzed after 9 months' storage retained an average of 67 percent of the initial nicotinic acid present.

When fresh or frozen fish were baked no loss of nicotinic acid was noted. Smoked herring and common suckers retained 66 and 72 percent, respectively, of nicotinic acid in the processed fish.

The nicotinic acid content of fresh, frozen, and smoked lake herring is considered comparable to the nicotinic acid content of lean meat. The content of carp, burbot, and common suckers is slightly lower.

The fate of N-methylnicotinamide in man, W. A. PERLZWEIG and J. W. HUFF (*Jour. Biol. Chem.*, 161 (1945), No. 1, pp. 417-418).—Data are briefly presented to explain steps in the transformation niacin in the body. The excretion of F₂ is considered to represent the resultant of the rates of two or more metabolic reactions involving niacin: (1) Its methylation to F₁ and (2) the subsequent conversion of F₂ to some as yet unknown product(s).

Riboflavin content of tropical foods, C. F. ASENJO, H. GARCIA DE LA NOCEDA, and P. SERRANO. (P. R. Univ. Expt. Sta. et al.). (*Food Res.*, 11 (1946), No. 2, pp. 137-141).—Determinations were made on the riboflavin content of 93 foods either produced or commonly consumed in Puerto Rico and the neighboring islands. The microbiological method of Snell and Strong (E. S. R., 82, p. 587) and its modification by Strong and Carpenter (E. S. R., 89, p. 514) were used.

The data are tabulated by food groups: Cereals and cereal products, fruits, root vegetables, beans, greens, seeds, other vegetables, dairy products, eggs, fish, meat and miscellaneous. The English and Spanish common names, as well as the scientific names, are listed, and brief descriptions of the samples and indication of the number of samples tested are also included in the tabulation. Riboflavin values are presented in terms of micrograms per 100 gm. of fresh edible portion; maximum, minimum, and average values are given.

The effect of varied thiamine intake on the growth of rats in tropical environment, A. O. EDISON, R. H. SILBER, and D. M. TENNENT (*Amer. Jour. Physiol.*, 144 (1945), No. 5, pp. 643-651, illus. 3).—Experiments were conducted on rats maintained at 90° F. and 70 percent relative humidity (tropical environment) and 72° and 50 percent relative humidity (temperate

environment). A purified diet was fed, supplemented with adequate vitamins, including thiamine at a concentration of 0.2 μ g. per 100 gm. of diet.

In the first experiment the rats were fed as follows: (1) Ad libitum at both temperatures, (2) those at 72° restricted to the intake of those at 90°, and (3) same as (2) with additional supplement of thiamine. Results showed that a loss of weight occurred with lowered food consumption which was not markedly improved in group (3) receiving additional thiamine. The ad libitum-fed rats at 90° consumed 10 gm. of food daily v. approximately 20 gm. consumed by those maintained at 72°.

A similar type of experiment with restricted and ad libitum feeding was carried out in which the daily thiamine intake was limited to 5, 10, and 30 μ g. per day. Results were comparable in that the amount of food consumed was a greater factor in weight change than the amount of thiamine in the diet. However, with restricted food consumption, best growth occurred at the highest levels of thiamine, although better growth resulted under tropical conditions than under temperate ones.

A third experiment used thiamine doses of 0, 30, and 300 μ g. per day. Even with the highest level of thiamine intake, the rats in a tropical environment consumed 30 to 50 percent less food than their paired mates at 72°. On a thiamine deficient diet, the incidence of polyneuritis was greater and appeared earlier in the rats maintained at 72° than those held at 90°. There was no significant difference among tropical and temperate groups in concentration of riboflavin, pantothenic acid, or nicotinic acid.

Surveys of the nutrition of populations.—V, The vitamin C nutrition of a rural population in middle Tennessee, J. B. YOUNG, E. W. PATTON, W. R. SUTTON, R. KERN, and R. STEINKAMP (*Amer. Jour. Hyg.*, 42 (1945), No. 3, pp. 254-261).—This report deals with the vitamin C nutrition of a population whose nutritional status with respect to other factors has been previously described (E. S. R., 93, p. 652). Records of the dietary intake revealed a vitamin C deficiency in a large proportion of the population. Medical history and physical examination of the subjects studied disclosed no cases of scurvy and infrequent clinical evidence of significant deficiencies; X-ray examinations revealed only one instance of bone changes indicative of mild scurvy. No subject tested failed to show some vitamin C in the blood, and only 10 subjects had a concentration less than 0.1 mg. per 100 cc. Assuming that concentrations below 0.3 mg. represent a subnormal state, 92 subjects (adult); representing 8.6 percent of those examined, were deficient.

Effect of home cooking practices on the ascorbic acid content of frozen and canned lima beans, H. I. WADSWORTH and E. B. WILCOX. (Utah Expt. Sta.). (*Jour. Amer. Dietet. Assoc.*, 21 (1945), No. 5, pp. 289-290).—Assays were made on the Henderson Bush variety of lima beans harvested green. The beans were shelled, washed, blanched 2½ min. in steam, cooled, then either quick frozen or canned in No. 2 cans. The fresh and blanched samples were assayed immediately, while the canned samples were stored at 72° F. for 4-9 weeks and the frozen beans kept at 0° for 14-18 weeks before testing. The fresh beans contained an average of 27.9 mg. ascorbic acid per 100 gm. fresh weight. The steaming-blanching caused a loss of ascorbic acid averaging 28 percent (19.9 mg./100 gm. beans).

The canned beans were assayed after various treatments—(1) after removal from can; (2) boiled 10 min. in a covered saucepan, and (3) held 24 hr. at 5° C. after the boiling and then reheated. Slightly less than 50 percent of the amount retained after blanching remained in the drained canned beans. Further losses occurred during the heating and holding procedures. Ascorbic

acid values of the drained beans were as follows: (1) 9.0, (2) 8.3, and (3) 6.0 mg./100 gm.

The frozen beans were assayed at the following stages: (1) Unthawed, (2) boiled 17 min. in tap water, (3) after holding the boiled beans 20 min. at 65°, (4) after holding 45 min. at 65°, (5) after holding the boiled beans 24 hr. at 5° then reheating to the boiling point, (6) boiled 17 min. in distilled water, and (7) boiled 15 min. in tap water containing NaHCO_3 (0.22 gm. in 75 cc. water). Ascorbic acid retention in the boiled frozen beans was somewhat greater than in the canned beans. Losses on holding were high. The ascorbic acid content, per 100 gm. of beans, in milligrams, were as follows: (1) 19.1, (2) 9.9, (3) 7.6, (4) 5.0, (5) 4.0, (6) 10.6, and (7) 11.2.

The results showed that sodium bicarbonate in the concentration used did not affect the retention of ascorbic acid in lima beans.

Ascorbic acid content of the mango in relation to variety, H. E. MUNSELL (*Food Res.*, 11 (1946), No. 2, pp. 95-98).—The majority of the fruits studied were selected with regard to uniform conditions of quality and ripeness at either the Federal or the University Experiment Station in Puerto Rico. Some samples were also obtained from St. Thomas, V. I., and from local vendors. Twenty-eight varieties were assayed, two samples of each variety being examined in most cases. Ascorbic acid was determined by an indophenol dye titration method.

Ascorbic acid values were found to range from 6.87 to 130.81 mg. per 100 gm. edible portion. Results obtained on two fruits of the same variety were similar irrespective of the locality in which they were obtained. Fruits of the Cambodiana variety (of equal maturity), whether from Mayaguez or Rio Piedras, assayed within the range of 30.59 to 37.50 mg. Mangoes of the Martinique variety from Mayaguez and from St. Thomas assayed 51.09 to 59.34 mg.

The common variety (mango pasote) averaged about 10 mg. per 100 gm. Three of the varieties studied: Climoise No. 3304, Governor Seedling No. 2, and Mango de hilo averaged over 120 mg. per 100 gm.

Tolerance curve of vitamin, C. M. ANDERSON. (Ohio State Univ.). (*Soc. Expt. Biol. and Med. Proc.*, 60 (1945), No. 1, pp. 12-14, illus. 1).—Twelve young college women, in a fasting state, were given 250, 500, 750 and 1,000 mg. of ascorbic acid orally. Lunch was limited to vitamin C-free foods. Blood samples were withdrawn at hourly intervals from immediately before to 6 to 10 hr. after the test dose. Vitamin C was assayed on the blood plasma by the Farmer-Abt micro-method (E. S. R., 75, p. 588).

Results showed that the maximum increase in ascorbic acid concentration occurred 1 to 4 hr. after a test dose was given. After the 250 mg. test dose, plasma levels reached their highest point (approximately 0.32 mg. increase) after 2 hr. With the other levels of dosage, peaks occurred in about 3 hr. (increases of approximately 0.62 to 0.67 mg. per 100 cc. plasma), with all three curves falling within a narrow range of less than 0.1 mg. variation over the 10-hr. period.

Effect of feeding glucoascorbic acid to white rats, chicks, and guinea pigs, S. BANERJEE and C. A. ELEVEHJEM. (Wis. Expt. Sta.). (*Soc. Expt. Biol. and Med. Proc.*, 60 (1945), No. 1, pp. 4-7, illus. 1).—Cotton rats and mice failed to grow, developed severe diarrhea, and showed hemorrhages in various parts of the body when fed a synthetic diet containing 10 percent glucoascorbic acid. Similar but less severe symptoms appeared where ascorbic acid alone was used. Autopsy revealed no hemorrhages in any part of the body. Animals fed 2 percent liver powder in addition to either 10 per-

cent glucoascorbic acid or ascorbic acid showed moderate diarrhea but normal growth. Glucoascorbic acid at levels of 5 and 1 percent also produced diarrhea.

Chicks showed no adverse effect of 10 percent glucoascorbic acid when it was added to a synthetic ration containing 2 percent solubilized liver. Severe loss of weight and diarrhea occurred in guinea pigs when 10 percent glucoascorbic acid was added to a natural diet. The addition of 10 percent ascorbic acid did not alleviate the symptoms, which were prevented by the addition of 6 percent 1 : 20 liver powder.

The authors suggest that the unfavorable effect of glucoascorbic acid in the diet of rats and guinea pigs may not be due solely to avitaminosis C action, but to a "lack of some factor other than vitamin C which is normally supplied by the intestinal flora and which is present in the liver 1 : 20 powder."

Secretion of vitamin D in milks of women fed fish liver oil, L. J. POLSKIN, B. KRAMER, and A. E. SOBEL (*Jour. Nutr.*, 30 (1945), No. 6, pp. 451-466).—Mothers appearing at the prenatal clinic were divided into groups and received varying amounts of vitamin D during pregnancy. A high protein, low fat diet was prescribed at the time but could not be checked.

Of those mothers receiving no preformed vitamin D during pregnancy, the majority showed less than 10 International Units per quart in their milk.

The average vitamin D content per quart of milk in the supplemented groups was as follows: (1) 10 I. U. for those receiving less than 100,000 I. U. of supplement; (2) 53 I. U. for those receiving between 128,000 to 224,000 I. U. of supplement; (3) 62 I. U. for those receiving between 256,000 to 320,000 I. U. of supplement; and (4) 53 I. U. for those receiving between 416,000 to 480,000 I. U. of supplement.

When the supplements were given during labor or for about 10 days thereafter, values of 91 to 583 I. U. were found.

The authors conclude "that for the purpose of fortifying human milk with vitamin D for infant use, supplementation of the mother with fish liver oil during pregnancy is not a practical method. . . . Vitamin D must be taken just prior to or during lactation in order to enrich the milk with the factor appreciably.

"The minimal dose of vitamin D which, when added as a supplement to the mother's basal diet, will yield a satisfactory increase of vitamin D in her milk has not been determined."

References cited number 61.

Experimental rickets in the hamster, J. H. JONES (*Jour. Nutr.*, 30 (1945), No. 2, pp. 143-146).—Experiments showed that on a diet containing approximately 0.4 percent calcium and 0.02 percent phosphorus, with no added vitamin D, hamsters developed all of the symptoms characteristic of experimental rickets observed in the rat on similar diets. On a diet containing optimal amounts of calcium and phosphorus and no vitamin D, calcification was as rapid as on the same diet containing added vitamin D. To produce typical rickets in the hamster, the diet must be low in phosphorus as well as deficient in vitamin D.

The relationship between vitamin M and the Lactobacillus casei factor, P. L. DAY, V. MIMS, and J. R. TOTTER. (Univ. Ark.). (*Jour. Biol. Chem.*, 161 (1945), No. 1, pp. 45-52, illus. 4).—Young rhesus monkeys were fed a vitamin M-deficient diet until characteristic symptoms appeared—anemic, leucopenia, loss of appetite, mild necrosis of the gums, and severe diarrhea. Highly purified *L. casei* factor was given intramuscularly, and produced immediate and marked improvement in the deficient animals. Erythrocyte counts, hemo-

globin levels, and white blood cells increased to normal or near normal levels. Reticulocytes increased sharply within 4-7 days after injection. The authors conclude that these experiments furnish "convincing evidence of the effectiveness of highly purified *L. casei* factor in vitamin M-deficient monkeys."

Further tests indicated that *L. casei* factor was relatively inert in stimulating the growth of *Streptococcus faecalis* until treated with an enzyme preparation from rat liver. After enzyme treatment, the activity for *S. faecalis* was comparable to that of a standard B₁₂ preparation. The authors assume that for nutrition of the higher forms of life (rat, chick, and monkey) the *L. casei* factor, vitamin B₁₂, and vitamin B₁₂ conjugate are interchangeable.

Vitamin P content of vegetables as influenced by chemical treatment, T. Y. Lo and S. M. CHEN (*Food Res.*, 11 (1946), No. 2, pp. 159-162).—Chinese red pepper (*Capsicum annuum*), peas (*Pisum sativum* L.), and Chinese lettuce were studied in experiments designed to test the influence of specific chemical substances upon the formation of vitamin P in vegetables. Field experiments were carried out using sulfates and nitrates of Ni, Al, Zn, Mg, Cu, and Fe, uranyl acetate, and molybdenum oxide, and a "complete fertilizer" singly or in combination. Vitamin P was estimated according to the method of Lorenz and Arnold (*E. S. R.*, 87, p. 482).

Values in milligrams per gram fresh basis ranged as follows: Peppers, 1.360-1.763; pea shoots, 1.335-1.671; green peas, 2.250-2.922; Chinese lettuce leaves, 3.531-5.570; and Chinese lettuce stems, 0.352-0.565.

Tabulated results indicate that compounds of Ni, Zn, and Mo seem to promote vitamin P formation in plant metabolism.

TEXTILES AND CLOTHING

A comparison of some Alabama manufactured chambrays, seersuckers, and denims with similar fabrics in ready-to-wear, G. M. SMITH and H. M. THOMPSON (*Ala. Univ., School Home Econ. Bul.* 10 (1946), pp. 16+).—The physical characteristics of 16 Alabama-manufactured chambrays, seersuckers, and denims were compared with 12 ready-made dresses, slack suits, and overalls obtained in retail stores or mail-order catalogs. Determinations were made on count in yarns per inch, twist, raveled strip breaking strength, elongation (warp and filling) weight per square yard, sizing, staple length of fiber, abrasion resistance, shrinkage, and colorfastness to light and laundering. The procedures found in A. S. T. M. standards were followed for tests except for staple length of fiber, shrinkage, desizing, and abrasion resistance.

The Alabama-manufactured chambrays and seersuckers were superior in breaking strength and resistance to abrasion, faded less when exposed to light or when laundered, although they shrank more and had a higher percentage of sizing than the ready-to-wear studied. As a whole, there was little difference between the Alabama denim fabrics and ready-to-wear overalls, although the former showed greater resistance to abrasion and faded less when exposed to light.

Smart styles from Alabama cottons, H. M. THOMPSON and G. SMITH (*Ala. Univ., Ext. News Bul.*, 3 (1946), No. 10, pp. 16, about 20 illus.).—This leaflet presents information based on a study which was conducted in the textile, clothing, and related art department of the school of home economics. Special emphasis is made on the original clothing designs worked out by the students for utilization of cotton fabrics.

Cotton and rayon fabrics used for glass curtains (*Ohio Sta. Bul. 659* (1945), pp. 170-171).—Previously noted (E. S. R., 90, p. 573).

"In general, cotton glass curtain fabrics gave evidence of being more durable and serviceable than rayon fabrics of similar construction because of their greater dry strength, gain in strength when wet, and smaller loss in strength after laundering. There was some relation between price and breaking strength, especially in the low and medium priced ranges. However, the most expensive fabrics were sometimes made of such fine yarns that they were weaker than lower priced fabrics. Effects of exposure to light varied with individual fabrics, loss in strength being appreciable in fabrics exposed at north windows. Except for acetate rayon, all fabrics lost more strength when stretched than when ironed. Of the rayons which were ironed, viscose voile lost the least strength and cellulose acetate the most. When stretched, cellulose acetate lost less strength than viscose or cuprammonium rayon. Upon exposure to light the three fabrics which changed most in hue were cellulose acetate rayons. The colorfastness to light of cotton marquisettes and filet and colorfastness to laundering of cotton marquisettes had some relation to price. There was appreciable shrinkage in most fabrics, especially in marquisette and bobbinet. Price was not closely related to shrinkage."

Effect of fiber content and care on resiliency, thickness, and thermal conductivity of blankets, P. A. GILMORE and K. P. HESS. (*Kans. Expt. Sta. Rayon Textile Mo.*, 27 (1946), No. 5, pp. 78-82, illus. 3).—The breaking strength, weave, thread count, weight per square yard, and percentage of finish of 13 blankets of varying fiber contents were determined by standard A. S. T. M. methods. Resiliency and thickness tests were made by means of a Saxl Compressometer. Wool blankets were found to be more resilient than blends, and blends containing wool were, in most cases, more resilient than those containing no wool.

The Cenco Fitch conductivity apparatus was used in determining the thermal conductivity of the blankets. Blends of cotton and rayon and of rayon, wool, and cotton, and an all-cotton blanket were found warmer than all wool ones. However, variation in protective value was comparatively small in the blankets of the same thickness.

With one exception, laundering and dry cleaning increased the protective value of all blankets containing wool and decreased with those containing cotton. Five launderings resulted in warp shrinkage of 6 to 16 percent, with all-wool blankets having the lowest percentage. Five dry cleanings caused the fabrics to shrink in the warp from one-tenth to five-tenths as much as did the five launderings.

Devices for producing artificial rainfall for tests of water-repellent and waterproof materials, M. I. LANDSBERG and F. J. MOODY (*Textile Res. Jour.*, 16 (1946), No. 5, pp. 211-218, illus. 12).—This article is one of a series of technical papers emanating from the laboratories participating in the Quartermaster Corps research program dealing with the principal phases of the research, development, and production problems of water-repellency. Simulating rainfall intensities, drop sizes, and drop velocities similar to those found in natural rainfall were produced by three nozzles furnishing approximately 0.1, 1, and 3 in. of rainfall per hour. Measurements have indicated that the sizes of the drops produced by the three nozzles agree with the sizes of the drops found in natural rains of similar intensities. These measurements are described, and variables were studied in the development of the work, including water pressure, nozzle height, design, and orientation with respect to the horizontal.

Selection of sewing thread (*Ohio Sta. Bul. 659 (1945), p. 170*).—“Heavy duty thread was outstanding in single strand strength, and it was the strongest when made up into seams, nylon thread being next highest in seam strength. Elongation at break was much greater for nylon thread than for any cotton thread, and 6-cord cotton thread had slightly higher elongation than 3-cord unmercerized cotton thread. In general, unmercerized cotton thread had the best balance of twist and caused least difficulty in hand sewing, while mercerized cotton thread and nylon thread were most poorly balanced and caused the greatest difficulty in hand sewing. Thread characteristics which varied considerably among different brands of the same type of thread were price, balance of twist, seam strength, ease of use in hand sewing, and color-fastness to laundering. The only consistent relationship of price to quality of a given type of thread applied to 6-cord thread, the lowest priced brand being the weakest and having the lowest elongation. Some useful information was supplied on labels of most of the thread tested.”

See also a previous note (*E. S. R.*, 91, p. 367).

HOME MANAGEMENT AND EQUIPMENT

Time expenditures on homemaking activities in 183 Vermont farm homes, M. MUSE (*Vermont Sta. Bul. 530 (1946), pp. 72, illus. 9*).—This bulletin reports data obtained from 183 housewives of Chittenden County, Vt., during a period of 3 weeks in 1943. Through eligibility requirements set up for the families, a sufficiently homogeneous sample was provided for the purpose of study. The findings concerned with the allocation of the housewife's time showed that homemaking activities averaged $64\frac{1}{2}$ hr. during 1 week, amounting to 38 percent of their total time and 59 percent of their waking hours. Food preparation, house cleaning (including care and upkeep), and dishwashing took 28, 21, and 12 percent of housewives' time. The homemaker did all the child care in 46 of the homes reporting and part of it in 32 of them, spending an average of $11\frac{1}{2}$ hr.

Persons other than the housewife gave an average of $17\frac{3}{4}$ hr. to homemaking, with hired workers in 26 cases averaging $25\frac{1}{2}$ hr. for the week. In 9 percent of the homes, women and girls of the family, other than the housewife, spent a total of 35 hr. or more during the week on homemaking activities—an additional 29 percent of the cases spent between 10 and $84\frac{1}{4}$ hr. Food preparation took 25 percent of all persons' time contributing to homemaking, dishwashing 15, housecleaning, care, and upkeep 22, care of household members 10, care of clothing and household linens 9, food preservation 6, and marketing and household business 3 percent.

Relationships were found between the amount of time spent on homemaking activities and the number of persons living in the household, as well as to the age of these persons. The time spent on these activities averaged 50 hr. for the week for two-person-households and rose to 119% for nine-person ones. Relationships between time expenditures and accomplishment of job as well as between time expenditures and efficiency, were also factors contributing to the allocation of the homemakers' time.

Some effects of the height of ironing surface on the worker, E. KNOWLES ([*New York*] *Cornell Sta. Bul. 833 (1946), pp. 57, illus. 35*).—Certain physiological responses of a homemaker while ironing have been previously noted (*E. S. R.*, 95, p. 285); however, this full report gives technical detailed analyses of the results of the controlled laboratory tests given to the 23 subjects. In the study of selection of desirable working heights the use of a

leveling platform was employed to measure stature; the wooden anthropometer for height of shoulder, bust, hip, and knee; a protractor head for slope of shoulder; spreading calipers for breadth or arc of the body; and tapes for certain measurements.

In addition to analyses of posture from motion films, mechanical platforms and attachments recorded the force exerted on the ironing board, postural balance, heart rate, and time. In this portion of the study, the subjects were found to assume a less favorable posture, pressed harder on the ironing board, and moved about too often to maintain posture at a height that was selected by them as more desirable. It was not until the subjects were given the opportunity to try different heights for ironing that they finally selected a board at a height at which their responses were most favorable.

"This study offers evidence that a desirable height cannot be established by rule-of-thumb method, nor can the body height be the criterion for the selection. . . . From the experience of the writer with this and previous studies, there seems, as yet, no satisfactory way for prescribing desirable working heights for an individual except through individual experimentation, which can be of a simple nature. Many factors influence the selection."

REPORTS AND PROCEEDINGS

Fifty-eighth Annual Report of the [Michigan Station], 1945, V. R. GARDNER (*Michigan Sta. Rpt. 1945, pp. 215-241*).—This consists mainly of lists of the publications of the year and of the active projects as of May 1, 1945. Results are also noted of studies on the mow drying of hay, new oil-wax emulsions, sheep parasites, penicillin and phemerol for mastitis control, a disease-resistant strain of the Honey Rock cantaloup, chemical control of weeds, a wilt-resistant mint, role of vitamins for dairy calves, use of DDT, fertilizers for fish ponds, a field-size vacuum sweeper for harvesting clover seed, relation of bees to clover and alfalfa seed production, control of potato scab, farm land prices, farm efficiency, radish seed vitality, band distribution of fertilizers in sod-culture orchards, and use of disease-free stock to control cherry yellows.

Farm science and practice. Sixty-third annual report of the Ohio Agricultural Experiment Station for the year ended June 30, 1944, E. SECREST (*Ohio Sta. Bul. 659 (1945), pp. 197, illus. 52*).—In addition to results noted elsewhere in this issue, this report includes data on farm income and living, including suggestions for attaining maximum agricultural production in Ohio in 1945, postwar problems, prepaid medical care for low-income farm families, country transportation of milk, factors affecting the milk supply in Akron, Canton, Dayton, and Portsmouth, and relationships between co-operative organizations; soil management, including the use of alfalfa, soybeans, and sweet-clover in rotations, and of alfalfa in soil erosion control, crown vetch as a bank cover, plowing under heavy applications of fertilizer and chemical nitrogen to increase corn yields, potash as a limiting factor in crop production, livestock v. a grain rotation, effect of rotation on soil structure and crop yield and of soil compaction on legume seedlings, mobility of added potash, injury by wheat straw to meadow seedlings, and a limestone evaluation chart; pasture and hay, including improved varieties and strains of alfalfa, bromegrass, Cumberland clover, hot-weather legumes for permanent pastures, pasture rotation, and white grub investigations; silage, including corn, sorgo, and alfalfa-cheat silage, density data, tests of the "silage carburetor," chemical and microbiological studies, effects of temperature and

chopping, palatability studies, and value of trench silos; grain, including corn studies as to hybrids and storage, oat and soybean varieties, defoliating soybeans to facilitate harvesting, wheat varieties and quality tests, and control of the European corn borer; livestock and poultry, including the value of corncocks for fattening steers, cross-breeding beef cattle, effect of calcium and phosphorus levels on reproduction in dairy cattle, levels of carotene and vitamin A in the plasma of dairy cows, vitamin D as an aid in controlling milk fever, value of amino acids in prolonging the storage of spermatozoa, effect of skim milk and potassium iodide on semen quality, legume silage as a roughage for sheep, protein sources for pigs on pasture, soybean oil meal for pigs on dry lot, cross-breeding hogs, crystal violet vaccine for hog cholera preventive, need of pantothenic acid by swine, poultry feed requirements, free choice v. limited feeding of whole grain to pullets, value of pascurage for chickens and pullets, need and sources of calcium and vitamin D by layers, a device for testing the breaking strength of eggshells, debeaking to control cannibalism, and dried fermentation solubles v. milk products in chick rations; fruits, including apple varieties and production costs, soil factors limiting grape yields in Ohio, cultural studies with peaches and raspberries, pear breeding for blight resistance, spraying for apple scab and cherry leaf spot, new fungicides for apple bitter rot, studies of the oriental fruit moth, Comstock's mealybug as a pest of apples, the peach tree borer, and lespedeza as a soil cover; vegetables, including studies of the susceptibility of cucumbers to bacterial wilt, quick freezing to control the bean weevil, susceptibility of bean varieties to various insects and onion varieties to thrips, potato varieties for yield and leafhopper resistance, new materials for potato sprays, hormone tests with potatoes, barley as a potato cover crop, sunflowers and rye as supplementary crops, resistant varieties of tomatoes to wilt and anthracnose, control of soil-borne diseases of glasshouse vegetables by nutrient solutions, new fungicides for vegetables, and the influence of a leaf character on adhesion of copper fungicides to vegetable leaves; foods, including vitamin potency of Ohio butter and evaporated milk, therapeutic value of milk from thyroidectomized goats, mineral content of tomatoes, conservation of vitamin C and calcium in tomatoes, collards, cabbage, and strawberries, fertility levels and carotene content of vegetables, and varieties of vegetables recommended for freezing; special crops, including the use of segmented sugar beet seed, loss of sugar beet seedlings due to *Aphanomyces cochlioides*, tobacco cultural tests, and production of belladonna; forestry, including timber production for war and postwar years, reforestation, recreational use, fire protection, timber marketing, preservative treatment of fence posts, blight-resistant chestnuts, and sawfly damage to forest plantings; turf and ornamentals, including control of buckhorn by *Sinox*, white grubs by arsenate of lead, aster wilt by breeding, and black spot of roses by organic fungicides, culture of greenhouse roses, early flowering of gardenias, propagation of chrysanthemums and roses, effect of the photoperiod and temperature on the flowering of azaleas, and flower-bud differentiation in hydrangeas; agricultural engineering, including farm refrigeration, ventilation of ear corn and grain, forced ventilation of partially cured hay, and food dehydration; control of the Japanese beetle in Ohio; and meteorological observations for 1943.

Oklahoma crops and soils, 1946 (*Oklahoma Sta. Bul. 295 (1946)*, pp. 111, illus. 10).—This is a report on current research as presented at the First Annual Oklahoma Crops and Soils Conference, and includes the following papers: Cooperative Studies at the Stillwater Outdoor Hydraulic Laboratory,

by V. J. Palmer (pp. 5-13) (U. S. D. A.); The Value and Interpretation of Chemical Tests for Available Plant Nutrients in Soil, by H. J. Harper (pp. 14-22); Summary of Chlorosis Experiments With Grapes at the Southern Great Plains Field Station, Woodward, Okla., by L. F. Locke (pp. 23-28) (U. S. D. A.), noted on p. 679; Wide Row Spacing of Small Grain. As a Nurse Crop for Sweet Clover and Lespedeza, by H. J. Harper (pp. 29-30); New Developments and Interpretation of Conservation Surveys, by L. E. Derr (pp. 31-35) (U. S. D. A.); Competition Between Alfalfa and Pecan Trees for Available Moisture, by F. B. Cross (pp. 36-37); Fertilizer in Relation to Oklahoma Agriculture, by H. F. Murphy (pp. 38-44); Effect of Dates and Depth of Tillage on Wheat Yields, by W. M. Osborn (pp. 45-50) (U. S. D. A.); Moisture Conservation and Wheat Production, by H. A. Daniel (pp. 51-54) (coop. U. S. D. A.); Grass in Crop Rotations, by V. C. Hubbard (pp. 55-59) (U. S. D. A.); Progress in Corn Improvement (abs.), by J. S. Brooks (p. 60) (E. S. R., 95, p. 195); Progress in Sorghum Improvement, by J. B. Seiglinger (pp. 61-64) (U. S. D. A.); A Year-Round Pasture Program, by H. W. Staten (pp. 65-67); Results of Sagebrush Control Studies at Woodward, Okla., by D. A. Savage (pp. 68-70) (U. S. D. A.); Machinery for Brush Removal and Control, by M. B. Cox (pp. 71-74) (coop. U. S. D. A.); Poisons for Eradicating Brush—Progress Report, by H. M. Elwell (pp. 75-76) (U. S. D. A.); Chemicals for Eradicating Weeds—Progress Report, by W. C. Elder, (pp. 77-78); and Revegetation of Eroded Land, by H. M. Elwell (pp. 79-84), Establishing Bermuda Grass From Seed, by C. W. Sittel (pp. 85-90), Kobe and *Sericea* Lespedeza in East-Central Oklahoma, by W. C. McCollum, (pp. 91-95), Grass Seed Harvesting, Cleaning, and Processing: A Summary of Techniques Developed by the Soil Conservation Service, U. S. Department of Agriculture, by J. E. Smith, Jr. (pp. 96-99), noted on p. 723; A Preliminary Study of the Distribution of Roots of *Ulmus pumila* in a Sand Dune, by E. W. Johnson (pp. 100-103), The Status and Use of Shelterbelts in Western Oklahoma, by H. R. Wells (pp. 104-108), and Urgent Agronomic Problems, by W. M. Nixon (pp. 109-111) (all U. S. D. A.).

Fifty-seventh Annual Report [of Tennessee Station], 1944, [C. A. MOOERS ET AL.] (Partly coop. U. S. D. A.). (*Tennessee Sta. Rpt. 1944, pp. 107, figs. 23*).—Progress results are reported in agronomy, including variety tests with soybeans, sorghum, cotton, oats, and barley, cultural studies with hemp, Sudan grass and millets alone and with soybeans as emergency hay crops, button clover, crimson clover, hairy vetch, and Austrian winter peas as winter annual legumes and as green manure, seeding dates for pasture, grazing oats, barley, wheat, and rye, nitrogen sources for wheat, fertilizer tests with cotton, and tests of cyanamid as a defoliant, corn hybrids, grass breeding, erosion control, and physical properties of cotton; agricultural engineering, including transplanting studies with tobacco, irrigation for tobacco, alfalfa, corn, lespedeza, potatoes, and truck crops, use of a new disk scarifier and a power hay distributor, and tests of hot-water seed treatments; animal husbandry, including comparisons of corn silage v. sorghum silage for fattening steers and barley v. corn for hog feeding, protein supplements for hogs on pasture, grazing and feeding tests with beef steers, breeding studies with beef cattle, ewes, and mules, once v. twice daily feeding for fattening cattle, finishing yearlings under war conditions, sorghum-corn silage v. chopped sweetpotatoes for fattening yearlings, feeding cattle in mineral-deficiency areas, fused tricalcium phosphate as a feed supplement and its effects on breeding, feeding systems for dry cows, and pastures for laying hens and growing chickens; chemistry, including studies of the decomposition of car-

bonates in soils, economic additions of liming materials, calcium silicate slag v. limestone, lime-potash relationships, potassium sulfate v. potassium metaphosphate, lime-phosphate studies, home dehydration and freezing of fruits and vegetables, composition and preparation of legume silage, preparation of fruit juice concentrates, sweetpotato dehydration, and protein and minerals in forage crops; economics and sociology, including agricultural adjustments, types of farming, and cotton marketing; forest and farm economic surveys; entomology, including studies of sweetpotato injury by the flea beetle *Systema elongata*, bean beetle control, and insecticidal properties of some coal-tar products; home economics, including the retention of ascorbic acid in foods and ascorbic acid metabolism; horticulture, including irrigation for strawberries and turnips, varieties of strawberries, raspberries, and blackberries, peas, tomatoes, cabbage, sweetpotatoes, sweet corn, and gladiolus, and spacing and mulching tests with garden sage; plant pathology, including bean diseases, wilt-resistant cotton, and leaf spot and wilt of tomatoes and watermelons; and at the branch stations variety and fertilizer tests with wheat, oats, and barley, seeding tests with oats and barley, varieties and rate of seeding with sorghums, rate of liming, eradication of bitterweed, pasture grazing crops, rotations, fertilizers, varieties and rates and dates for planting corn, tobacco irrigation and topping of tobacco, legume silages and grain for calves and steers, and fertilizers and irrigation needs for bush beans and tomatoes.

MISCELLANEOUS

Abbreviations of generic names, C. E. SKINNER. (Univ. Minn.). (*Science*, 104 (1946), No. 2690, p. 62).—The author points out that "the practice of using abbreviations for generic names is admissible only in cases where it does not lead to confusion," and argues that since there are no official generic abbreviations, in the interests of scientific accuracy the full scientific name should be used at least once in an article in which generic abbreviations are used.

A multiple light source microscope, G. I. LAVIN (*Science*, 104 (1946), No. 2690, p. 61, illus. 1).—The apparatus described renders it possible to photograph tissues, using visible, infrared, polarized, fluorescent, and 2,537 a. u. light, for purposes of comparison under the different wavelengths.

Particle counts in the ultramicroscope, E. H. M. BADGER (*Nature* [London], 157 (1946), No. 3989, p. 480).—A brief note on errors in counting.

Polk County, Texas—a geographic survey, E. M. SMELLEY (*Tex. Geog. Mag.*, 9 (1945), No. 1, pp. 15–21, illus. 3).—This survey includes brief reports on the geographic divisions, forestry industries, agriculture, oil industry, livestock production, and trade and transportation of the county.

Canada's agricultural resources (*Agr. Inst. Rev.* [Canada], 1 (1946), No. 5, pp. 277–295, about 40 illus.).—Papers are included as follows: The Place of Agriculture in the Canadian Economy, by W. M. Drummond (pp. 279–283, 321); The Agricultural Soil Resources of Canada, by A. Leahey (pp. 285–289); Water for Irrigation, by B. Russell (pp. 291–294); Cultivated Hay and Pasture Crops and Natural Grazing Lands, by T. M. Stevenson and S. E. Clarke (pp. 295–301); Cereal Grains, by L. H. Newman (pp. 303–304, 307–309); Fruits and Vegetables, by M. B. Davis (pp. 311–313, 315); Meat and Wool, by J. G. Taggart and F. M. Schrader (pp. 317–321); Dairy Cattle, by A. R. Ness (pp. 323–325, 327); Poultry and Egg Production, by J. R. Cavers (pp. 329–333); Special Crops, by J. Coke (pp. 335–341); The Farm Woodlot, by G. A. Mulloy (pp. 343–345); Fur Farming, by C. K. Gunn

(pp. 347-349); Farm Mechanization and Electrification, by E. A. Hardy (pp. 351-353); Marketing and Processing Facilities, by W. C. Hopper (pp. 355-361); Industrial Use of Agricultural Products, by W. H. Cook (pp. 363-368); Canada's Contribution to World Food Requirements, by F. Shefrin (pp. 369-371, 373-375); The Farmer, by H. S. Fry (pp. 377-379, 381-382); Agricultural Science and Education, by L. E. Kirk (pp. 383-387); and The Future of Canadian Agriculture, by E. S. Archibald (pp. 389-391, 393, 395).

Colorado Farm Bulletin [May-June 1946] (*Colo. Farm Bul.* [*Colorado Sta.*], 8 (1946), No. 3, pp. 15, illus. 11).—In addition to several articles noted elsewhere in this issue, this number contains Gadgets Load Hay the Easy Way (pp. 4-5), which describes the use of an 18-ft. "needle" made from a pump rod, two chains, and a low-platform hayrack; and Feed the Right Amino Acids, by A. R. Patton (pp. 13-14).

This is the final issue of this publication, which has been superseded by the *Colorado A & M News*.

Mississippi Farm Research [February 1946] (*Miss. Farm Res.* [*Mississippi Sta.*], 9 (1946), No. 2, pp. 8, illus. 2).—In addition to articles noted elsewhere in this issue and meteorological notes for January 1946, this number contains Soil Survey Program for Mississippi, by H. B. Vanderford (pp. 1, 2, 4); Cotton Production Costs in Northeast Mississippi, by W. J. Edens (pp. 3, 4), also to be issued as a station bulletin; Suggestions for Control of Parasites in Horses, by J. W. Scales (pp. 1, 6); and High Vitamin A Content in Creamery Butter Kept in Winter by Supplemental Grazing, by F. H. Herzer (p. 8).

Research and Farming [April 1946] (*Res. and Farming* [*North Carolina Sta.*], 4 (1946), Prog. Rpt. 3, pp. 12, illus. 11).—In addition to several articles noted elsewhere in this issue, this number contains The Trend in N. C. Crops, by R. E. L. Greene (pp. 3, 9), showing the yields per acre, acreage, and production of the major crops in North Carolina, 1866-1945; and Summer Rains Take the Soil, by T. L. Copley and L. A. Forrest (p. 12) (coop. U. S. D. A.).

Bimonthly Bulletin [May-June 1946] (*North Dakota Sta. Bimo. Bul.*, 8 (1946), No. 5, pp. 31, illus. 6).—In addition to articles noted elsewhere in this issue and several reviews and abstracts, this number contains Diseases of the Respiratory System of Chickens, by D. F. Eveleth and F. M. Bolin (pp. 3-6); How to Use the Veterinary Laboratory (pp. 7-8) and Mastitis or Garget (pp. 9-10), both by D. F. Eveleth; Brand Inspection of Livestock for North Dakota, by L. E. Arndt (pp. 13-18); The Land Market in North Dakota, 1941-1945, by J. W. Porter and R. Engelking (pp. 19-22) (coop. U. S. D. A.); and North Dakota Farm Prices, by P. V. Hemphill (pp. 23-25).

Abstract of new publications and list of publications available (*Oklahoma Sta., What's New in Okla. Farm Res. No. 10* (1945), pp. 16).—This consists mainly of Bulletins 284-290, Circular 119, Technical Bulletins 21 and 22, and Mimeographed Publications 136, 139, and 145, all of which have been previously noted; and also of the following: Mimeographed Publications 135, Fattening Lambs on Wheat Pasture, by H. M. Briggs (pp. 2); 137, Swine Improvement Through Inbreeding and Outcrossing, by O. W. Willham (pp. 3); 138, Protein Supplements for Fattening Swine, by C. P. Thompson and J. C. Hillier (pp. 3); 140, Rural Farm Housing Characteristics in Oklahoma, by R. T. McMillan (pp. 9); 141, Small Grain Results, 1945: Wheat, Oats, Barley, Flax (mistitled "rye" for "flax"), by C. B. Cross (pp. 11); 142, Grazing Trials: Winter Small Grains and Ryegrass, by H. W. Staten (pp. 13); 143, Forage Production of Winter Small Grain Varieties and Annual

Rye Grass, and Effect of Clipping Upon Grain Yields, by H. W. Staten and E. H. Muncrief (pp. 7); 144, Elm Diseases in Oklahoma, by K. S. Chester (pp. 3); 146, The Oklahoma Vegetable Research Station at Bixby—Progress Report, 1945, by H. B. Cordner and F. A. Romshe (pp. 10); 147, DDT—A New Insecticide, by F. A. Fenton et al. (pp. 8); 148, Instructions for Using DDT as a Barn and Cattle Spray, by F. A. Fenton (pp. 2); 149, Supplements for Fattening Two-Year-Old Steers on Grass, by A. E. Darlow et al. (pp. 5); 150, Oklahoma Farm Production Prospects for 1946 (coop. U. S. D. A.); 151, Oklahoma Farm Wheat Improvement Program, 1944–45, by R. M. Oswalt (pp. 5); 152, DDT as a House, Restaurant, or Dairy Spray, by F. A. Fenton (pp. 33); 153, The Southwestern Corn Borer, by R. R. Walton (pp. 4); and 154, Brush Mowing Machines, by M. B. Cox (pp. 5). A list of available station and extension publications is appended.

Farm and Home Science [June 1946] (*Farm and Home Sci. [Utah Sta.]*, 7 (1946), No. 2, pp. 20, about 20 illus.).—In addition to several articles noted elsewhere, this number contains Economical Turkey Production in Utah, by B. Alder (pp. 1, 17), which stresses the importance of using economical feeds; *Lygus* Control on Sugar Beets Grown for Seed, by G. F. Knowlton and W. E. Peay (pp. 11–12) (coop. U. S. D. A.), pointing out that dusting with 10 percent DDT increases seed production; and Yield of Onion Seed Increased by Thrips Control, by W. E. Peay and C. J. Sorenson (p. 12).

Bibliografía puertorriqueña, 1493–1930, A. S. PEDREIRA (*Puerto Rico Univ. Monog., Estud. Hispánicos, Ser. A, No. 1* (1932), pp. 707+).—This comprehensive bibliography of Puerto Rican literature includes subsections on agriculture (pp. 148–199), silviculture (pp. 199–202), and zootechny (pp. 202–210).

Jewish agriculture in Palestine, L. SAMUEL (*Jerusalem: Jewish Agency for Palestine, Econ. Res. Inst., 1946*, pp. 143+, illus. 6).—This survey contains much statistical data. The first section deals with the markets for the main products other than citrus and the second with suggestions for a sound agricultural policy.

[Recent advances in science] (*Sci. Prog. [London]*, 34 (1946), No. 136, pp. 778–786, 795–805).—The following are included: Biochemistry, by W. O. Kermack (pp. 778–786); Plant Physiology, by W. Stiles (pp. 795–800); and Entomology, by A. D. Lees (pp. 800–805).

Confidence limits for biological assays, C. I. BLISS. (Conn. [New Haven] *Expt. Sta. et al. (Biometrics Bul., 1* (1945), No. 5, pp. 57–65, illus. 1).—“A large-sample approximation may be involved when fiducial or confidence limits are computed from the standard errors of the terms used in biological assays. In many cases a correct answer requires the exact limits, which are not difficult to compute when their equations are reduced to a uniform symbolism. For experiments based upon a graded response the exact limits cover the log-dose for both a given and an observed response and for two-dose design and the confounded two-dose design. Equivalent limits based upon an all-or-none or quantal response include these for a required effect, such as the LD50 and for the log-ratio of potencies.” There are 24 references.

The shadow-casting technique in electron microscopy, T. F. ANDERSON (*Jour. Bact., 51* (1946), No. 4, p. 563).—An abstract.

One man—Edward Asbury O'Neal III of Alabama, P. O. DAVIS (*Auburn: Ala. Polytech. Inst., [1946]*, pp. 123, illus. 2).—This is an appreciative account by the director of the Alabama State Extension Service.

NOTES

Missouri University and Station.—The death on November 12 is noted of Dr. F. B. Mumford following an automobile accident in October in which Mrs. Mumford was also killed. A detailed account of his life and service appeared in the *Record* at the time of his retirement as dean and director in 1938 (E. S. R., 79, p. 145). Since that time he had continued his interest in agricultural education and research, bringing out a series of station circulars on the postwar experiment station and a 300-page history of the Missouri College of Agriculture. He was also active in the Association of Land-Grant Colleges and Universities, serving as a member of the executive committee until 1941 and as president at the annual convention of that year.

Nebraska University and Station.—The resignations are noted of Dr. H. D. Tate, professor and chairman of the department of entomology, to engage in commercial work, and Arnold Gadeken, assistant in rural economics, to go into agricultural extension. Recent appointments include Drs. Ephraim Hixson and Carl Olson, Jr., as professors of entomology and animal pathology, respectively, and chairmen of their departments; Dr. Ian W. Tervet as associate professor of plant pathology; Ralph Benton and I. L. Williams, Darrell D. Deane, and Lester F. Larsen as assistant professors of poultry husbandry, dairy husbandry, and agricultural engineering, respectively; Dr. Max L. Schuster as instructor in plant pathology; Gerald E. Abbenhaus and Arden Sherf as assistants in rural economics and plant pathology, respectively; and James C. Adams as superintendent of the North Platte Substation.

New Hampshire University.—Laurence A. Bevan has been appointed associate director of extension.

Rutgers University.—Edwin V. Bearer, associate professor of agricultural education since 1920, was killed in an automobile accident while traveling to address a group of high school students. He was 60 years of age.

North Carolina College and Station.—C. E. Van Deman, in charge of apple research at North Wilkesboro since 1937, has resigned to engage in commercial work. Mary E. Thomas, extension specialist in foods and nutrition since 1926, retired September 30. Eugene A. Wilkenning has been appointed instructor in rural sociology.

North Dakota College and Station.—Clifford C. Volkerding has been appointed associate soil scientist and assistant dean of agriculture.

Ohio Station and State University.—Dr. Carlos G. Williams, associated with the station since 1903, died October 4 at the age of 83 years. A native of Ohio, he served as station agronomist from 1903 to 1921, as director from 1921 until his retirement in 1937, and subsequently as consulting agronomist. He was president of the American Society of Agronomy in 1926 and vice president of Section O of the American Association for the Advancement of Science in 1931.

Dr. Joseph H. Gourley, chairman of the department of horticulture of the university and chief of horticulture in the station, died October 27 aged 68 years. A native of Pennsylvania, he received the B. S. degree from the University in 1908, the M. S. degree in 1915 from the University of Chicago, and

the Ph. D. degree in 1931. Beginning as assistant horticulturist in the station in 1908 he became assistant professor of horticulture in the university in 1910, and professor of horticulture and horticulturist in the New Hampshire College and Station in 1912 and the West Virginia University and Station in 1920, returning to Ohio in 1921. He served as president of the American Society of Horticultural Science in 1923 and subsequently as vice president of Section O in the American Association for the Advancement of Science.

Oklahoma College and Station.—Dr. R. C. Jaap, professor of poultry husbandry and poultry husbandman, has accepted a similar position in the Ohio State University. T. D. Runnels, who has been on naval leave from the West Virginia University and Station, has been appointed associate professor of poultry husbandry and Harry L. Hathaway assistant professor and assistant in that subject.

Texas College.—A department of range and forest management has been established with Vernon A. Young, professor of range management in the University of Idaho, as head and with Omer E. Sperry in charge of range plants and plant and range ecology and Robert R. Rhodes in charge of forestry work. D. H. Reid has been succeeded as head professor of poultry husbandry by Dr. J. H. Quisenberry, who has been serving as associate professor and poultry husbandman in the Hawaii University and Station.

Washington College.—Dean E. C. Johnson has been granted a year's leave of absence to go to Colombia as an agricultural advisor to the National Director of Agriculture at Bogota.

Wisconsin University and Station.—Recent grants for research include one of \$108,350 to aid a study of factors affecting the production and action of antibiotics on animal and plant diseases and one of \$30,000 for an industrial fellowship to study the nature and production of antibiotics; \$6,500 to assist in work on the subfractionation of globulins of horse serum and seasonal variations and other phases of the antigen-antibody relationship; \$2,000 for an industrial fellowship to study the nutritional requirements of micro-organisms; and two grants of \$850 each by the Holstein-Friesian and Guernsey breed associations for continuing the studies of the genetic factors in the blood of cattle.

Dr. J. J. Porter, instructor in veterinary science, was killed recently in an automobile accident while returning to his home after addressing a meeting of the State Veterinary Medical Association.

Dr. Conrad E. Elvehjem, professor and chairman of the department of biochemistry, has been appointed dean of the Graduate School.

Office of Experiment Stations.—Dr. Edward R. McGovran, entomologist in the division of control investigations of the U. S. D. A. Bureau of Entomology and Plant Quarantine, has been appointed experiment station administrator (entomology), vice Dr. Floyd Andre, whose appointment as assistant director of the Wisconsin Station and professor of entomology has been previously noted.

U. S. Department of Agriculture.—Harris P. Gould, associated with the horticultural work of the Bureau of Plant Industry, Soils, and Agricultural Engineering since its establishment in 1901 until his retirement in 1941 and from 1939 chief of its division of fruit and vegetable crops and diseases, died October 17 at the age of 75 years. A native of Maine, he had received the B. S. degree from the University of Maine and the M. S. A. degree from Cornell University. Prior to his coming to the Department he had served as assistant horticulturist in the Maine and Cornell Stations, as nursery and orchard inspector in New York, and as assistant entomologist and horticul-

tourist in the Maryland College and Station. He was widely known as an investigator in fruit production and an authority on fruit nomenclature.

Joint U. S. D. A.-Land-Grant College Policy Committee.—A joint committee representing the U. S. Department of Agriculture and the Association of Land-Grant Colleges and Universities has been appointed by Secretary of Agriculture Clinton P. Anderson and Dean T. P. Cooper, president of the association. The purpose of this committee is to study cooperative extension policies and programs in view of the needs for additional educational services in agriculture and home economics. President Emeritus Walter C. Coffey, University of Minnesota, is to serve as chairman of the committee, the remaining members being Dr. Edmund deS. Brunner, professor of rural sociology, Teachers College, Columbia University; P. V. Cardon, U. S. D. A. Agricultural Research Administration; President Herman L. Donovan, University of Kentucky; President Roy M. Green, Colorado State College; President John A. Hannah, Michigan State College; President John R. Hutcheson, Virginia Polytechnic Institute; W. A. Minor, Assistant to the Secretary, U. S. Department of Agriculture; Thomas E. Wilson, chairman of the board of Wilson and Company; and David Meeker, manager of education for Harry Ferguson, Inc.

National Advisory Research Committee.—The advisory committee provided for in the Research and Marketing Act of 1946 (E. S. R., 95, p. 448) has been named by Secretary of Agriculture Clinton P. Anderson as follows: H. E. Babcock, chairman of the board of trustees of Cornell University; Fred Bailey, legislative counsel for the National Grange; Robert R. Coker, vice president of Coker's Pedigreed Seed Company, Hartsville, S. C.; John H. Davis, executive secretary of the National Council of Farmer Cooperatives; Charles F. Kettering, general manager of the Research Laboratory Division, General Motors Corporation; C. W. Kitchen, executive vice president of the United Fresh Fruit and Vegetable Association; Albert K. Mitchell, manager and co-owner of the 470,000-acre Bell Ranch located in New Mexico; James G. Patton, president of the National Farmers Union; Walter L. Randolph, president of the Alabama Farm Bureau Federation; H. J. Reed, dean of the Purdue University School of Agriculture and director of the Indiana Experiment Station and the department of agricultural extension; and Kerr Scott, North Carolina State Commissioner of Agriculture. The act specifies that the Secretary of Agriculture shall be chairman of the committee.

Tobacco Research Stations in India.—According to a recent note from the American Consulate in Calcutta, a number of research stations are being opened. These include one at Rajahmundry for cigarette tobacco, one at Anand for Bidi tobacco, and a central research station for all types at Guntur in Madras.

EXPERIMENT STATION RECORD

Vol. 95

December 1946

No. 6

RECENT WORK IN AGRICULTURAL SCIENCE

AGRICULTURAL AND BIOLOGICAL CHEMISTRY

Currents in biochemical research, edited by D. E. GREEN (*New York 3: Interscience Pubs., 1946, pp. 486+, illus. 8*). --This treatise "represents an attempt by some 30 research workers to describe in as simple language as possible the important developments in their own fields and to speculate a little on the most likely paths of future progress." The articles are as follows: The Gene and Biochemistry, by G. W. Beadle (pp. 1-12); Viruses, by W. M. Stanley (pp. 13-23); Photosynthesis and the Production of Organic Matter on Earth, by H. Gaffron (pp. 25-48); The Bacterial Cell, by R. J. Dubos (pp. 49-60); The Nutrition and Biochemistry of Plants, by D. R. Hoagland (pp. 61-77), (Calif. Expt. Sta.); Biological Significance of Vitamins, by C. A. Elvehjem (pp. 79-88), (Univ. Wis.); Some Aspects of Vitamin Research, by K. Folkers (pp. 89-107); Quantitative Analysis in Biochemistry, by D. D. Van Slyke (pp. 109-121); Enzymic Hydrolysis and Synthesis of Peptide Bonds, by J. S. Fruton (pp. 123-135); Metabolic Process Patterns, by F. Lipmann (pp. 137-148); Biochemistry From the Standpoint of Enzymes, by D. E. Green (pp. 149-164); Enzymic Mechanisms of Carbon Dioxide Assimilation, by S. Ochoa (pp. 165-185); Hormones, by B. A. Houssay (pp. 187-206); Fundamentals of Oxidation and Reduction, by L. Michaelis (pp. 207-227); Mesomeric Concepts in the Biological Sciences, by H. M. Kalkar (pp. 229-240); Viscometry in Biochemical Investigations, by M. A. Lauffer (pp. 241-260); Isotope Technique in the Study of Intermediary Metabolism, by D. Rittenberg and D. Shemin (pp. 261-276); Mucolytic Enzymes, by K. Meyer (pp. 277-290); Some Aspects of Intermediary Metabolism, by K. Bloch (pp. 291-304); The Steroid Hormones, by G. Pincus (pp. 305-320); Plant Hormones and the Analysis of Growth, by K. V. Thimann (pp. 321-333); Chemical Mechanism of Nervous Action, by D. Nachmansohn (pp. 335-356); Some Aspects of Biochemical Antagonism, by D. W. Woolley (pp. 357-377); Chemotherapy—Applied Cytochemistry, by R. D. Hotchkiss (pp. 379-398); Biochemical Aspects of Pharmacology, by A. D. Welch and E. Bueding (pp. 399-412); Some Biochemical Problems Posed by a Disease of

¹ The publications abstracted in these columns are seldom available for distribution by the Office of Experiment Stations. In general, application should be made to the Office of Information of the U. S. Department of Agriculture, Washington 25, D. C., for publications of the Department; to the directors of the State agricultural experiment stations, as listed on page 3 of the cover of this issue, for publications of the several experiment stations; and to publishers of books and journals for material issued by them. Microfilms and photostatic copies, the latter legible without magnifying equipment, may be purchased from the Library, U. S. Department of Agriculture, Washington 25, D. C. Rates and other details will be supplied by the Library on request.

Muscle, by C. L. Hoagland (pp. 413-425) ; Physiology and Biochemistry, by C. H. Best (pp. 427-438) ; X-Ray Diffraction and the Study of Fibrous Proteins, by I. Fankuchen and H. Marks (pp. 439-452) ; Immunochemistry, by M. Heidelberger (pp. 453-460) ; Social Aspects of Nutrition, by W. H. Sebrell (pp. 461-472) ; and Organization and Support of Science in the United States, by L. C. Dunn (pp. 473-486).

Advances in enzymology and related subjects of biochemistry, VI, edited by F. F. NORD (*New York 3: Interscience Pubs., 1946, vol. 6, pp. 563+, about 50 illus.*).—This series was initiated for publishing critical reports abutting on the borderland between physiology, chemistry, microbiology, and physical chemistry ; continued participation in keeping abreast of this vast subject has again (E. S. R., 94, p. 147) resulted in a volume which—as has been the endeavor since its inception—"approaches the true polis of the enzymologist." The following papers are included, with bibliographies at the end of each. The Bacterial Amino Acid Decarboxylases, by E. F. Gale (pp. 1-32) ; Enzyme Problems in Relation to Chemotherapy, "Adaptation," Mutations, Resistance, and Immunity, by M. G. Sevag (pp. 33-127) ; Biological Antagonisms Between Structurally Related Compounds, by D. W. Woolley (pp. 129-146) ; Adenosinetriphosphatase Properties of Myosin, by V. A. Engelhardt (pp. 147-191) ; States of Altered Metabolism in Diseases of Muscle, by C. L. Hoagland (pp. 193-230) ; Acetyl Phosphate, by F. Lipmann (pp. 231-267) ; Microbial Assimilations, by C. E. Clifton (pp. 269-308) ; Chemical Changes in the Harvested Tobacco Leaf—Part I, Chemical and Enzymic Conversions During the Curing Process, by W. G. Frankenburg (pp. 309-387) ; The Actions of the Amylases, by R. H. Hopkins (pp. 389-414) ; The Amylases of Wheat and Their Significance in Milling and Baking Technology, by W. F. Geddes (pp. 415-467) ; and Tocopherol Interrelationships, by K. C. D. Hickman and P. L. Harris (pp. 469-524). Author and subject indexes and a cumulative index to volumes I-VI are provided.

Enzymes and their role in wheat technology, edited by J. A. ANDERSON (*New York 3: Interscience Pubs., 1946, pp. 371+, about 40 illus.*).—This volume, the first of a series of monographs sponsored by the American Association of Cereal Chemists, deals with enzymes because of the important part they play in wheat technology and the rapid progress that has recently been made in our knowledge of them. Only the enzymes of the greatest interest to the cereal chemists are here treated, with a broad review of existing knowledge of each class and a discussion of what is known of the part played by the enzymes in wheat technology. The topics covered in the several chapters are as follows: The General Chemistry of Enzymes, by W. M. Sandstrom (pp. 1-21) (Univ. Minn.) ; Amylases, by M. L. Caldwell and M. Adams (pp. 23-88) ; Applications of the Amylases in Milling and Baking Technology, by E. Kneen and R. M. Sandstedt (pp. 89-126) (Univ. Nebr.) ; Esterases, by H. E. Longenecker (pp. 127-152) ; Esterases in Relation to Milling and Baking, by B. Sullivan (pp. 153-174) ; Oxidizing Enzyme Systems, by E. S. C. Barron (pp. 175-214) ; Oxidizing Enzyme Systems of Wheat and Flour, by B. Sullivan (pp. 215-230) ; Proteases, by A. K. Balls and M. W. Kies (pp. 231-273) (U. S. D. A.) ; Role of Proteases in Baking, by F. C. Hildebrand (pp. 275-294) ; The Mechanism of Alcoholic Fermentation, by C. H. Werkman (pp. 295-320) (Iowa State Col.) ; and Yeast Fermentation, by L. Atkin, A. S. Schultz, and C. N. Frey (pp. 321-352).

Physical methods of organic chemistry, II, edited by A. WEISSBERGER (*New York 3: Interscience Pubs., 1946, vol 2, pp. 737-1367+, illus. 234*).—This second volume of methods for the observation of the physical properties of organic compounds continues the plan of treatment adopted in volume 1 (E. S. R., 94, p. 145), containing articles of the proportions and nature of small monographs on Spec-

trospecty and Spectrophotometry (pp. 737-821), and Colorimetry, Photometric Analysis, and Fluorimetry (pp. 823-867), both by W. West; Polarimetry, by W. Heller (pp. 869-988); Determination of Dipole Moments, by C. P. Smyth (pp. 989-1009); Conductometry, by T. Shedlovsky (pp. 1011-1150); Potentiometry, by L. Michaelis (pp. 1051-1114); Polarography, by O. H. Müller (pp. 1115-1211); Determination of Magnetic Susceptibility, by L. Michaelis (pp. 1213-1247); Determination of Radioactivity, by W. F. Bale and J. F. Bonner, Jr. (pp. 1249-1289); and Mass Spectrometry, by D. W. Stewart (pp. 1291-1314); followed by a detailed subject index (52 pages) for the two volumes.

Electrophoretic investigation of peanut proteins, I, II. (U. S. D. A.) (*Arch. Biochem.*, 7 (1945), No. 3, pp. 475-489, illus. 4; 8 (1945), No. 2, pp. 239-249, illus. 4).—Of the two opening papers of this series, the first is concerned with the indications of electrophoretic analyses as to the protein components present and their approximate percentages, whereas the second, in addition to further electrophoretic observations, includes some notes on possible industrial applications of peanut protein preparations.

I. *Peanut meal extract, arachin, and conarachin*, G. W. Irving, Jr., T. D. Fontaine, and R. C. Warner.—Electrophoretic analysis of an extract believed to contain at least 98 percent of the protein of peanut meal indicated the presence of two major protein components which occur in the approximate ratio of 7:1, and which, together, comprise approximately 87 percent of the protein in the extract. The remaining 13 percent of the protein in the extract is held probably to consist of at least two minor protein components present in approximately equal amounts. Arachin, which comprises approximately 63 percent of the protein of peanut meal, was found to consist only of the two major protein components, the proportions being approximately 76 percent of the electrophoretically faster moving component (A) and approximately 24 percent of the slower moving component (B). Arachin was found to contain none of the minor protein components of the meal. Conarachin, which comprises approximately 33 percent of the protein of peanut meal, was found to consist of approximately 80 percent of component A, 20 percent of the minor components, and apparently none of the B component. The protein which remained after the successive removal of arachin and conarachin from a peanut meal extract consisted largely, if not exclusively, of the minor protein components and comprised approximately 3 percent of the protein of the meal. This protein fraction was isolated and found to contain 2.9 percent sulfur, a particularly high sulfur content for a vegetable protein. Deductions made from the results presented and from published analytical data indicated that the high-sulfur fraction may contain relatively large amounts of methionine and, possibly, large amounts of hydroxyamino acids other than serine and threonine.

II. *Composition of several peanut protein fractions*, T. D. Fontaine, G. W. Irving, Jr., and R. C. Warner.—The electrophoretic analysis of several protein fractions obtained by simple precipitation procedures from slightly alkaline extracts of peanut meal is presented.

A fraction which comprised approximately 90 percent of the total protein of peanut meal, obtained by adjusting a slightly alkaline extract of peanut meal to pH 4.5, was shown to contain approximately 90 percent of the major protein components and approximately 58 percent of the minor protein components of the meal. "Although this fraction is not truly representative of the total protein of the peanut, it is, nevertheless, more nearly representative than is either arachin or conarachin, each of which is completely deficient in one of the protein components of the meal." A protein fraction nearly identical electrophoretically with that obtained by precipitation at pH 4.5 could be obtained by precipitation at pH 6.0. This fraction exhibited plastic properties not possessed by the fraction

precipitated at pH 4.5. The protein which remained in solution after the removal of the fraction precipitable at pH 6.0 could be precipitated by adjusting the solution to pH 4.5. The protein fraction thus obtained had a quantitative electrophoretic composition which was markedly different from that of either of the other fractions described and from arachin and conarachin. A protein fraction which had a comparatively high sulfur content could be isolated from the mother liquor remaining after the removal of the protein precipitable at pH 4.5. The protein of this fraction was shown electrophoretically to be composed almost exclusively of the minor protein components of the peanut and is a readily available source of material for the investigation of these sulfur-rich vegetable proteins.

The electrophoretic composition and physical properties of these fractions and the high yields with which they could be obtained strongly suggested the applicability of certain of these fractions in food products or in the preparation of adhesives, fibers, and other industrial materials.

Improvement in the color of peanut and cottonseed proteins, T. D. FONTAINE, S. B. DETWILER, JR., and G. W. IRVING, JR. (U. S. D. A.). (*Indus. and Engin. Chem.*, 37 (1945), No. 12, pp. 1232-1236, illus. 3).—Protein preparations as light in color as commercial samples of soybean protein or lighter than these could be obtained from the meals of white-skin peanuts and blanched red-skin peanuts, without the use of bleaching agents. The color of proteins prepared from meals of unblanched red-skin peanuts and cottonseed was improved considerably through the use of controlled protein extraction and precipitation technics and by washing and the moist protein precipitates with organic solvents such as dioxane, acetone, and methyl ethyl ketone. By following procedures here given it was possible to obtain from meal of unblanched red-skin peanuts and from cottonseed meal satisfactory yields of protein preparations lighter in color than those obtained heretofore from similar raw materials. These preparations approached in color very near to the range of practical usefulness for the production of adhesives and fibers. The use of heat in drying was shown to exert inappreciable influence upon the color of dried peanut protein.

Zein fibers: Preparation by wet spinning, C. B. CROSTON, C. D. EVANS, and A. K. SMITH. (U. S. D. A.). (*Indus. and Engin. Chem.*, 37 (1945), No. 12 pp. 1194-1198, illus. 6).—A new method for producing textile fibers from zein and the equipment used in the process are described. Zein fibers which had high tensile strength and wool-like properties were produced from alkaline dispersions of zein. The spinning dispersions were formulated to give a product of high viscosity by the use of denaturing agents, such as alcohol or urea, or by aging the solutions. The filaments were coagulated in an acid bath in which salts may or may not be used. The coagulated filaments were given a mild formaldehyde precure prior to stretching and drying. The influence of the extent of precure on the load-elongation properties of the fiber and on fiber strength was determined. Shrinkage and water resistance of the fibers were controlled by acetylation followed by a strong formaldehyde treatment.

The protein-formaldehyde reaction: The question of methylene bridges and the unreactivity of benzoyl-d(—)-alanine toward formaldehyde, D. C. CARPENTER. (N. Y. State Expt. Sta.). (*Arch. Biochem.*, 9 (1946), No. 2, pp. 159-164, illus. 1).—In extension of a considerable number of previous investigations of the nature of both stable and unstable combinations of formaldehyde with proteins and amino acids (E. S. R., 95, p. 2), the author here discusses calculations of bond distances which show that methylene groups cannot be expected to bridge the distance found by X-ray diffraction methods between parallel peptide chains in proteins. Specifically, the methylene group is shown to be capable of bridging

a distance of no more than 2.40 a. u. between nitrogen atoms, 2.52 a. u. between carbon atoms, or 2.46 a. u. between a nitrogen and a carbon atom, whereas the X-ray data show the distance between peptide chains to be 4.5 a. u. It was further observed that experiment carried out with benzoyl-*d* (—)-alanine showed no indication of reaction between the imino group of the —CONH linkage and formaldehyde; a reaction which would be a necessary prelude to the formation of methylene bridges between peptide chains.

An electrophoretic analysis of changes produced in blood serum and plasma proteins by heat in the presence of sugars, C. R. HARDT, I. F. HUDDLESON, and C. D. BALL. (Mich. Exp. Sta.). (*Jour. Biol. Chem.*, 163 (1946), No. 1, pp. 211–220, illus. 15.)—*d*-Glucose inhibited the formation of the C component when bovine plasma was heated under conditions that caused its formation in the absence of *d*-glucose. *d*-Galactose, *l*-arabinose, sucrose, *d*-fructose, lactose, *d*-mannitol, and *d*-xylose all showed some degree of inhibiting action against the C component formation in heated bovine serum. Aging in the presence of *d*-glucose did not alter the electrophoretic patterns of bovine plasma. Studies on bovine plasma fractions gave further evidence of the inhibiting action of *d*-glucose against C component formation but did not explain the mechanism of its formation. The C component was formed by heating an albumin- α -globulin fraction of bovine plasma.

Studies on the enzymatic synthesis of dextran from sucrose, E. J. HEHRE. (Cornell Univ.). (*Jour. Biol. Chem.*, 163 (1946), No. 1, pp. 221–233, illus. 2).—A bacterial enzyme which catalyzed the formation of a serologically reactive polysaccharide (dextran) from sucrose was obtained from sucrose broth cultures of a strain of *Leuconostoc mesenteroides* by a method which yielded preparations more potent than those previously available.

Analyses of enzyme-sucrose mixtures for each of the known reactants showed that the conversion of sucrose to dextran proceeded nearly to completion according to the equation, n sucrose $\rightarrow$ dextran + n fructose. The concentration of sucrose influenced the initial activity of the dextran-synthesizing enzyme in the same way as it does invertase. The enzymatic synthesis of dextran simulated a first order reaction in systems containing 1 percent sucrose but resembled a zero order reaction in systems containing 5 percent sucrose. The corresponding unimolecular and zero order velocity constants can therefore be utilized to measure the activity of the enzyme. The addition of purified dextran to enzyme-sucrose mixtures did not increase the initial velocity of dextran formation. It is pointed out, however, that this observation does not exclude a possible activating effect of dextran, since small quantities of the preformed dextran, possibly sufficient to prime the reaction, were found regularly to accompany the active enzyme. A number of well-known enzyme inhibitors, including azide, cyanide, fluoride, and iodoacetate, were shown to be without effect upon the dextran-synthesizing enzyme.

New methods of preparing invert sirup, T. R. FREEMAN. (Fla. Expt. Sta.) (*Ice Cream Rev.*, 29 (1946), No. 10, pp. 48, 50, 58).—The author's observations on sucrose inversion noted above are here discussed in relation to their practical application in ice cream manufacture. Methods for the preparation of an invert sirup of high quality by the use either of phosphoric acid (at a cost, for the acid, of about 5 ct. per 100 lb. of sucrose) or of tartaric acid (at about 45 ct. per 100 lb. of sucrose inverted) are formulated, the required temperature (175° F.) being attainable in a pasteurizing vat. A practical advantage of this temperature over that of the boiling point of a heavy sugar solution (about 225°) lies in the fact that the lower-temperature inversion can be performed in equipment used for other work in the ice cream plant, whereas the higher-temperature steam kettles are usually not at hand or are of limited size. The phosphoric acid

method given calls for mixing 100 lb. of cane or beet sugar with 44 lb. of water, to which is added at the beginning of the heating 45 cc. of 85-percent phosphoric acid. The mixture is heated as quickly as possible to 175°, held during 1.5 hr. at this temperature, with the vat covered to prevent evaporation, and then added directly to the ice cream mix.

The oxidative pathway of glucose decomposition ([New York] Cornell Sta. Rpt. 1945, p. 108).—By means of preparations of the enzymes from *Micrococcus lysodeikticus*, the reactions involved in the initial stages of the oxidation of glucose by organisms not able to ferment this sugar were studied. The reactions established include, first, a phosphorylation of the glucose to glucose-6-phosphate; second, an oxidation of this phosphogluconic acid; third, an oxidation of this material to a ketophosphogluconic acid; and, fourth, decarboxylation of this compound to yield a pentose. The knowledge acquired with respect to the preparation of the necessary enzyme systems is believed sufficient to permit ascertaining the reactions involved in further stages of the oxidative process.

Production of 2,3-butanediol from acid-hydrolyzed starch, G. E. WARD, O. G. PETTJOHN, and R. D. COHILL. (U. S. D. A.). (*Indus. and Engin. Chem.*, 37 (1945), No. 12, pp. 1189–1194).—Acid-hydrolyzed starches fermented by *Aerobacter aerogenes* gave 13.5 to 14.0 lb. of 2,3-butanediol per 34 lb. of pure starch (equivalent to 1 bu. of corn). Proper balance in trace element content was important in determining the efficiency of the fermentation. Addition of manganese, cobalt, or molybdenum decreased butanediol production. Addition of copper or zinc improved the fermentation of some, but not all, samples. Treatments of starch hydrolyzates with an ion-exchange agent was generally effective in increasing the butanediol yield.

The synthesis of isocitric acid, G. W. PUCHER and H. B. VICKERY. (Conn. [New Haven] Expt. Sta.). (*Jour. Biol. Chem.*, 163 (1946), No. 1, pp. 169–184).—The authors showed that the synthesis of isocitric acid by the hydrolysis of trichloremethylparaconic acid leads to a mixture of two diastereoisomeric forms in relative proportions of between 5:1 and 6:1, the racemic modification of the natural optically active acid being the predominating component. The method was modified in detail with improvement in yield. The synthesis of isocitric acid by the reduction of oxalosuccinic ester and subsequent hydrolysis led to a mixture of isomers in more nearly equal proportions. The separation of this mixture was difficult, and unsatisfactorily small yields of the lactone of the desired racemic acid were secured in pure form. Alloisocitric acid was obtained in small yield from the reaction products of both methods but was not successfully purified as the lactone. Derivatives of this isomer were shown to differ from the corresponding derivatives of the racemic modification of the natural acid.

Several derivatives of both isocitric lactone and of alloisocitric lactone are described. Of these, the *p*-bromophenacyl esters were shown to be useful both for characterization and for separation of the isomers. The neutral *p*-toluidine salt of isocitric lactone was found to have potentialities for the large-scale purification of this substance. Neither the trihydrazide of isocitric acid nor any of several pseudothiuronium salts of the lactones proved to be advantageous for characterization or for separation of the isomers.

The antilinositol effect of γ -hexachlorocyclohexane, S. KIRKWOOD and P. H. PHILLIPS. (Wis. Expt. Sta.). (*Jour. Biol. Chem.*, 163 (1946), No. 1, pp. 251–254, illus. 1).— γ -Hexachlorocyclohexane inhibited the growth of the Gebrüder Mayer strain of *Saccharomyces cerevisiae*. This inhibition was found to be reversible by the addition of *t*-inositol. The other three known hexachlorocyclohexanes inhibited the growth of Gebrüder Mayer yeast to a slight degree, but this inhibition was not reversible by *t*-inositol. These data correlated closely with the

demonstrated ineffectiveness of the α -, β -, and δ -isomers as insecticidal agents. It is noted that the data suggest that the spatial configuration of the γ -isomer is similar to that of *i*-inositol and further support the hypothesis that the γ -isomer exerts its insecticidal action by interfering with the inositol metabolism of the insect.

Production of methyl vinyl ketone from methylvinylcarbinol, J. J. KOLVENBACH, E. F. TULLER, L. A. UNDERKOFER, and E. I. FULMER. (Iowa State Col.). (*Indus. and Engin. Chem.*, 37 (1945), No. 12, pp. 1178-1180).—The authors describe a procedure for the catalytic vapor-phase oxidation of methylvinylcarbinol to give methyl vinyl ketone. The catalysts considered consisted of combinations of zinc oxide with cupric or cuprous oxide. The yields of methyl vinyl ketone were about 63 percent of theory under optimum conditions. With adequate equipment to control temperature rise during the reaction, the yields of methyl vinyl ketone would be considerably increased.

Liquid-vapor equilibria in the acetylmethylcarbinol-water system, R. H. BLOM and A. EFRON. (U. S. D. A.). (*Indus. and Engin. Chem.*, 37 (1945), No. 12, pp. 1237-1240, illus. 4).—Liquid vapor equilibrium data for the acetylmethylcarbinol-water system at atmospheric pressure were determined. The acetylmethylcarbinol used was prepared from 2,3-butylene glycol by vapor-phase oxidation. The purification of the carbinol is described. The composition and boiling point of the acetylmethylcarbinol-water azeotrope at a pressure of 760 mm. were established.

Rhodanese, E. L. COSBY and J. B. SUMNER. (Cornell Univ.) (*Arch. Biochem.*, 7 (1945), No. 3, pp. 457-460, illus. 1).—This enzyme, occurring in kidneys and liver and capable of causing the synthesis of "rhodanate" or thiocyanate from hydrocyanic acid and sodium thiosulfate with simultaneous formation of sodium bisulfite, was concentrated about 100-fold by finely disintegrating 100 gm. of beef liver with 100 cc. of ice water, adding 24 cc. each of chloroform and of 95 percent alcohol, shaking vigorously, and centrifuging to remove much protein, dialyzing with continued maintenance of low temperature, and precipitating fractionally with ammonium sulfate in the presence of neutral phosphate, the final precipitate of the enzyme being dissolved in neutral phosphate buffer solution.

A method for the measurement of the activity of the enzyme is described, and certain errors in earlier conclusions as to the behavior of the enzyme are corrected.

Densities of GR-S latices, C. C. WINDING. (Cornell Univ.) (*Indus. and Engin. Chem.*, 37 (1945), No. 12, pp. 1203-1206, illus. 6).—A densitometer capable of indicating densities of unvented GR-S latices with an absolute accuracy of approximately 0.002 gm. per cubic centimeter is described. The design permits the instrument to operate over a wide range of pressures without affecting its accuracy. The present instruments have been constructed to withstand pressures of 100 to 150 lb. per square inch, but this range can be extended.

Complete data on samples of stripped and unvented GR-S latices of various degrees of conversion were obtained. Above 44.5 percent conversion the density of the unstripped samples increased linearly with conversion. The slope of this curve was 0.00114 gm. per cubic centimeter per percentage conversion, or 0.0035 gm. per cubic centimeter per percentage total solids. The data showed that below 45 percent conversion two phases were present. Above 25° C., the density of stripped latex of 75 percent conversion and of the unvented latices of various conversions decreased linearly with temperature. The rate of decrease for the stripped latex was approximately 0.0004 gm. per cubic centimeter per degree centigrade and for unvented latex, approximately 0.0006 gm. per cubic centimeter per degree centigrade.

Enzymic nature of the carotene-destroying system of alfalfa, H. L. MITCHELL and S. M. HAUGE. (Ind. Expt. Sta.) (*Jour. Biol. Chem.*, 163 (1946), No. 1, pp. 7-14, illus. 3).—The authors discuss briefly the accumulated evidence of the existence in alfalfa of an oxidizing enzyme system largely responsible for the loss during field curing under good curing conditions of from 45 to 80 percent of the original carotene content; and report upon an investigation of the time-temperature relationships involved in the inactivation of the carotene-destroying system by heat and projected to obtain additional data concerning the enzymic nature of the system.

The enzyme involved appeared to be a lipoxidase. It was partially or completely inactivated by heat, ethanol, copper sulfate, lead acetate, formaldehyde, pancreatin, sodium cyanide, thiourea, and sodium fluoride, but not by sodium sulfate and sodium chloride, and was salted out of solution by half saturation with ammonium sulfate. Its inactivation by heat was a function of both temperature and time. Maximum inactivation occurred in the plant tissue above 80° C. and in plant extracts above 70°, and virtually complete inactivation in the plant tissue was obtained at 90°–100° in less than 10 sec.

With reference to the practical application of the information obtained, it is noted that "the data on the relation of time and temperature to carotene preservation may be of importance to the engineer in the development of equipment for the production of alfalfa hay and leaf meal of high carotene content. To be of practical value, the heat treatment must be of short duration. This period of treatment may be less than 10 sec. at 90°–100° if the heat transfer is efficient. However, preliminary experiments in this laboratory showed that inactivation could not be obtained by subjecting the plant tissue for short periods of time to a stream of air heated to 200°. The evaporation of water prevented the leaves from reaching the temperature necessary for inactivation of the enzyme. Therefore, in the design of the equipment, consideration should be given to methods for the effective transfer of heat to the tissue."

The function of B vitamins ([New York] Cornell Sta. Rpt. 1945, p. 109).—In an investigation of the action of pyridoxine and its analogs, the coenzyme which is the active form of this vitamin was synthesized and shown to be pyridoxal phosphate. It was shown that the coenzyme when recovered in the pure state was most active in the enzyme systems studied than was pyridoxal, which had been used as a standard for assaying the coenzyme. The function of this coenzyme, termed codecarboxylase, was extended to five amino acids. This coenzyme was also shown to function in transamination. In the conversion of the pyridoxine, pyridoxal, and pyridoxamine to codecarboxylase by growing cells and resting cells, those forms which serve as vitamin B₆ for a given organism were shown to be converted to codecarboxylase.

Function of the vitamin B₆ group: Pyridoxal phosphate (codecarboxylase) in transamination, H. C. LICHSTEIN, I. C. GUNSAUS, and W. W. UMBRETT, (Cornell Univ.). (*Jour. Biol. Chem.*, 161 (1945), No. 1, pp. 311-320, illus. 3).—Methods for growing cells of *Streptococcus fecalis* R with highly active transaminase enzymes were devised, and the enzymes were obtained in dried cell preparations and in a water-clear, cell-free condition.

Pyridoxal phosphate, previously shown to function as the coenzyme of amino acid decarboxylases, was shown to function as the coenzyme of the glutamate-aspartate transaminase. This was accomplished (1) by growing cells in a medium deficient in pyridoxal to yield transaminase apoenzyme and activating the enzyme with synthetic pyridoxal phosphate; (2) by resolving the cell-free enzyme from organisms grown with pyridoxal and restoring the activity of this apoenzyme with pyridoxal phosphate. The function of the vitamin B₆ group in protein

metabolism is therefore at least partially explained as that action in amino acid decarboxylation and in transamination.

The function of pyridoxine: Conversion of members of the vitamin B₆ group into codecarboxylase, W. D. BELLAMY, W. W. UMBREIT, and I. C. GUN-SALUS. (Cornell Univ.). (*Jour. Biol. Chem.*, 160 (1945), No. 2, pp. 461-472, *illus.* 4).—The authors show that the known members of the vitamin B₆ group are converted into codecarboxylase by micro-organisms capable of utilizing them as a source of vitamin B₆. The efficiency of codecarboxylase formation by growing cells was found to be from 10 to 20 times as great as with cell suspensions or call preparations of *Streptococcus fecalis* R. Cell suspensions of *S. fecalis* R formed codecarboxylase from pyridoxamine in the presence of a keto acid. Organisms capable of growing without vitamin B₆ were shown to synthesize codecarboxylase. The codecarboxylase content of rat tissue was shown to be directly related to the pyridoxine level in the diet.

Simple automatic control for vacuum systems, J. J. SPADARO, H. L. EL VIX, and E. A. GASTBOOK. (U. S. D. A.). (*Indus. and Engin. Chem., Analyt. Ed.*, 18 (1946), No. 3, p. 2, 4, *illus.* 1).—The device described and illustrated is a modification of a commercial form of Cartesian manostat designed to admit air to the system as needed to maintain the pressure reduction at a level constant to within ± 0.25 mm. by mechanical means involving no electrical connections. A floating bell tube in mercury is so arranged that the reduction in pressure inside and outside the bell is the same until the desired pressure reduction has been attained, but the interior of the bell is then shut off from the pumping system. Any further reduction of pressure thereafter raises the bell against the stem of a leakage valve, holding this open until air sufficient to restore the required pressure has been admitted.

Reaction vessel for maintaining constant pH by continuous electrometric titration during sodium amalgam reductions, N. SPERBER and D. R. BRIGGS. (Univ. Minn.). (*Indus. and Engin. Chem., Analyt. Ed.*, 18 (1946), No. 1, pp. 74-75, *illus.* 2).—An electrode chamber is sealed onto the side of a three-necked reaction flask, a disk 3 cm. in diameter and perforated with numerous holes from 1 to 2 mm. in diameter separating the reaction vessel proper from the electrode vessel. From the lowest point of the electrode vessel a tube providing the main return for mercury leads to the main body of the reaction vessel at a point about 1 cm. above bottom. A second return tube, for the aqueous solution of the reactants, leads from the middle of one side of the electrode vessel downward to an opening into the reaction vessel about one-third of its height from the bottom and has a short section within the reaction vessel and turned into the direction of movement of the rapid and power-mechanical stirrer. Reduction of pressure by the rapidity of motion of the reaction flask contents at this point causes a circulation of the flask contents through the perforated disk into the electrode chamber and back to the reaction flask. Acid or alkali, as required to correct the change in pH in the course of the reaction, is added from a burette as needed to hold the reading of a pH meter connected to the electrode as nearly as possible to the selected pH value. It was shown to be possible to control the pH value in a constantly changing reaction mixture within a range of from 0.5 to 1 pH unit. Construction of the apparatus is described and illustrated by a drawing, and details of its operation are given.

Laboratory study of continuous vegetable oil extraction: Countercurrent extractor, rising-film evaporator, and oil stripper, A. C. BECKEL, P. A. BELTER, and A. K. SMITH. (U. S. D. A.). (*Indus. and Engin. Chem., Analyt. Ed.*, 18 (1946), No. 1, pp. 56-58, *illus.* 3).—Apparatus useful for studies of continuous vegetable oil extraction in the laboratory are described. These consist of a

continuous countercurrent extractor capable of supplying essential data, such as completeness of oil extraction, contact time, solvent-to-solid ratio, miscella composition, and solvent carry-over; a rising-film evaporator of the natural circulation type provided with a separator for continuous oil removal; and a new and efficient oil stripper providing turbulence and then films by operating against gravity and against surface tension.

The succulometer, an instrument for measuring the maturity of raw and canned whole kernel corn, A. KRAMER and H. R. SMITH. (Md. Expt. Sta.) (*Canner*, 102 (1946), No. 24, pp. 11-13, illus. 3; *Food Packer*, 27 (1946), No. 8, pp. 56, 58, 60, illus. 3).—The instrument described makes possible the measurement of the maturity of corn, based on the quantity of extractable juice, to give results equal in accuracy to a reliable moisture test on the raw product and the alcohol insoluble solids test on the canned product. A table is given showing the relationship of the succulometer values to the maturity tests—very young fancy whole kernel corn (raw), which would produce at least 23 cc. of extractable juice, should yield 20 cc. in the final product. Similarly, raw corn for an extra standard product should produce about 20 cc. of extractable juice, and the canned product should not fall below 16 cc.; raw corn yielding only 13 cc. of extractable juice would be dangerously close to the substandard level. Simple to operate and construct, the results from the test are obtainable in a few minutes' time.

Di- and triethylene glycols as manostat fluids, W. J. HUNCKEL and D. M. OLDROYD. (U. S. D. A.) (*Indus. and Engin. Chem., Analyt. Ed.*, 18 (1946), No. 1, pp. 80-81).—It is noted that precision fractionations may extend over periods of a month or more and require, therefore, not only a very precise pressure control but also freedom from difficulties interrupting the operation; and that sulfuric acid, either concentrated or diluted to a specific gravity of 1.71, is corrosive, hygroscopic, and readily fouled by grease from the stopcocks. Both diethylene glycol and triethylene glycol are readily available, and both were found superior to sulfuric acid as manostat fluids. Both these glycols have sufficient electrical conductivity to operate a highly sensitive electronic relay, but when they are used with a less sensitive thermionic relay a drop of concentrated sulfuric acid must be added to provide sufficient conductivity. The specific gravities, viscosities, boiling points, and vapor pressures of the two glycols discussed are compared in a table with those of 75 percent and 80 percent sulfuric acid and of mercury.

Experimental dryer for pre-pilot plant studies, D. A. COLKER. (U. S. D. A.) (*Indus. and Engin. Chem., Analyt. Ed.*, 18 (1946), No. 1, pp. 71-72, illus. 3).—The experimental unit described uses an air-circulation method of drying in which heated air is forced at high velocity through a bed of the material to be dried, supported upon perforated metal. A feature of the device is the control of the proportion of fresh to recirculated air and of steam supplied to the air-heating coils by a wet-bulb and dry-bulb recorder controller.

Colorimetric determination of nitrites, B. F. RIDER and M. G. MELLON. (Purdue Univ.). (*Indus. and Engin. Chem., Analyt. Ed.*, 18 (1946), No. 2, pp. 96-99, illus. 3).—Spectrophotometers of two types were used to determine the effects of reagent concentration, order of addition of reagents, pH, temperature, light, nitrite concentration, and the presence of 68 diverse ions on the reddish purple coloration produced by 4-aminobenzenesulfonic acid (sulfanilic acid) and 1-aminonaphthalene (α -naphthylamine) in the presence of nitrous acid. It was shown that reliable determinations can be made in the range of 0.025 to 0.600 p. p. m. of nitrite ion in a 2-cm. cell, and that as little as 0.0005 p. p. m. of nitrite nitrogen can be determined by the use of 24-cm. Nessler tubes. Time

had to be allowed for complete diazotization before the coupling agent was added. Diazotization was carried out in strongly acidic solution at room temperature in diffuse light, and the system was buffered to pH 2.0 to 2.5 for coupling.

Titrimetric determination of sulfate in natural waters and soil extracts, E. C. CANTINO. (Univ. Calif.). (*Soil Sci.*, 61 (1946), No. 5, pp. 361-368, illus. 2).—The author reviews conclusions of previous investigators to the effect that methods based on precipitation of sulfates by an acid solution of barium chromate followed by determination of the released chromate, which remains soluble in alkaline solution, are usually inaccurate. He adds his observation in repeated experiments, that analysis of residual chromate left in solution after simultaneous removal of barium chromate and barium sulfate seldom yields results which coincide with the absolute concentration of sulfate originally present. "Extensive investigations indicate conclusively, however, that with proper control of the procedure, results established by titrimetric analysis are a function of the original sulfate content within relatively wide limits." Upon this basis, the author elaborated an empirical, rapid method of analysis for sulfate in waters in which sulfate is precipitated with an acid solution of barium chromate, excess barium is eliminated by alkalization, and residual chromate is determined by titration with thiosulfate of the iodine set free from potassium iodide by the chromate. The actual sulfate content was found to be a function of the thiosulfate titer, and an evaluation of the sulfate concentration could be made either by comparison with a standard curve or by formula.

On the determination of plasma iodine, A. TAUROG and I. L. CHAIKOFF. (Univ. Calif.). (*Jour. Biol. Chem.*, 163 (1946), No. 1, pp. 313-322, illus. 1).—The authors tested the Chaney method² for the determination of plasma iodine content by means of the radioactive iodine isotope, I^{131} . With a few modifications this procedure was found to yield satisfactory results for the determination of iodine, not only in 3 cc. of plasma but also in small amounts of thyroid tissue and in dietary mixtures. Organic material was digested with a mixture of chromic and sulfuric acids, a process that oxidized iodine to nonvolatile iodic acid. The latter, together with the excess chromic acid was reduced with phosphorous acid, and the volatile iodine formed thereby was distilled and trapped in an alkaline solution. The iodine was then measured by its catalytic effect on the reduction of ceric sulfate by arsenious acid.

Values for total and protein-bound iodine of plasma of several species are reported. The levels of protein-bound iodine in the plasma of dog, rat, mouse, and domestic fowl were found to be quite similar (3% to 4% percent). The proportions contained in human plasma were appreciably higher (5% to 8% percent).

The determination of thyroxine in the thyroid gland of the rat, A. TAUROG and I. L. CHAIKOFF. (Univ. Calif.). (*Jour. Biol. Chem.*, 163 (1946), No. 1, pp. 323-328).—The fresh glands were hydrolyzed in 2 N sodium hydroxide solution, the hydrolysates were neutralized and adjusted to a pH value between 3.5 and 4, and the thyroxine was extracted by a butyl alcohol method. Nonthyroxine iodine compounds were removed from the butyl alcohol thyroxine solution by treatment with a specified aqueous alkaline solution, the butyl alcohol was completely removed from the thyroxine extract by heating at from 50° to 60° C. under reduced pressure in a stream of carbon dioxide, and the iodine content of the residue was determined by the method noted in the preceding abstract. In the aqueous layers from the butyl alcohol extraction and the purification of the butyl alcohol extract, the nonthyroxine iodine content of the glands was also determined.

² *Indus. and Engin. Chem., Analyt. Ed.*, 12 (1940), No. 3, pp. 179-181, illus. 3.

Estimation of iodine color of starches and starch fractions, S. A. WATSON and R. L. WHISTLER. (U. S. D. A.). (*Indus. and Engin. Chem., Analyt. Ed.*, 18 (1946), No. 1, pp. 75-76).—Thirty mg. of starch are dispersed in 10 cc. of 1 N potassium hydroxide by allowing the mixture to stand with occasional shaking at 0° C. for 1 to 2 hr. For starch in the whole-granule state, 20 cc. of 0.5 N potassium hydroxide are used for the dispersion. The dispersion is neutralized with 1 N hydrochloric acid to a phenolphthalein end point and 1 drop of acid added in excess. The solution (pH 4 to 6) is then made up to 100-cc. volume, giving a starch concentration of 0.03 percent. By this procedure a constant quantity of salt is introduced into each sample. Large proportions of salt, which produce changes in the iodine color, are to be avoided. To 10 cc. of the solution in a 16- by 150-mm. test tube is added 0.5 cc. (10 drops) of 0.01 N iodine solution ($KI=0.014\text{ M}$) dropwise, with shaking. After 0.1 cc. (2 drops) has been added, the color of the solution is observed. At this point, the presence of small amounts of amylose in amylopectin will be evidenced by a blue color. The remainder of the 0.5 cc. of iodine is then slowly added and the color again observed. Further addition of iodine is unnecessary and in some cases may vitiate the color test by superimposing of the color of free iodine on the starch-iodine color. All observations of color are made by transmitted daylight of a daylight fluorescent lamp and colors compared to the standard color chart.

Colors observed in the application of the iodine test in this form to starches, starch fractions, and starch derivatives are described in terms of the Ridgeway color chart names and of the Munsell numerical notation.

Anomalous behavior of methyl 12-hydroxy-9,10-octadecenoates in rapid iodine number determinations, P. S. SKELL and S. B. RADLOVE. (U. S. D. A.). (*Indus. and Engin. Chem., Analyt. Ed.*, 18 (1946), No. 1, pp. 67-68).—The authors showed that the methyl esters of ricinoleic, ricinelaidic, and O-propionylricinoleic acids quantitatively add iodine chloride from Wijs reagent in less than 1 min. However, when mercuric acetate was present, methyl ricinoleate and ricinelaidate reacted with additional halogen, thus giving high iodine values, whereas the methyl O-propionylricinoleate behaved normally. This anomalous effect was shown to be due to the presence of the free hydroxyl group.

Viscosimetric determination of thymonucleodepolymerase, M. LASKOWSKI and M. K. SEIDEL. (Univ. Ark.) (*Arch. Biochem.*, 7 (1945), No. 3, pp. 465-473, illus. 3).—A method for the quantitative determination of thymonucleodepolymerase is based on measurements of the change in viscosity of the reacting mixture. The reaction was found to be roughly of the first order, and the value of the velocity constant K was used for the determination of enzymic activity. Fairly good proportionality between the value of K and the amount of enzyme used was observed. The optimal pH of thymonucleodepolymerase was close to 7. The enzyme was activated by magnesium ions, optimal concentration being 0.025 M.

A proposed unit of thymonucleodepolymerase is defined as an amount of enzyme which will give the value of the velocity content $K = (1/t) \log (\eta_0/\eta_t) = 1 \times 10^4$ when incubated with 25 mg. of thymonucleic acid (prepared according to Hammarsten) at 37° C., at pH 7 in 0.2 M borate buffer, made 0.025 M with respect to $MgSO_4$; total volume of the reacting mixture 8 cc.; time of incubation 30 min.; readings at 5-min. intervals.

Determination of tocopherol in plant tissue, M. E. WALL and E. G. KELLEY. (U. S. D. A.). (*Indus. and Engin. Chem., Analyt. Ed.*, 18 (1946), No. 3, pp. 198-201, illus. 1).—In both of the two procedures here compared, dry plant materials were extracted with Skellysolve B, the alcohol then being removed. It was necessary to purify the sample before the final estimation could be made.

Chlorophyll and xanthophyll were separated from tocopherols by adsorption on a Supercel-activated magnesia column. Carotene and tocopherolquinones were then destroyed by treatment with 85 percent sulfuric acid.

In the first of the procedures compared, the tocopherols were transferred to ethanol solution, oxidized with nitric acid, and, after removal of ethanol-insoluble lipoids, determined with a photoelectric colorimeter at 480 $m\mu$. In the alternative procedure the tocopherols were finally dissolved in chloroform, and reacted with the ferric chlorid- α -dipyridyl reagent. The pink ferrous dipyridyl complex was immediately transferred to aqueous solution to prevent further reduction of the iron by a slowly reducing fat-soluble compound. The colorimetric determination was carried out at 620 $m\mu$. In a photoelectric colorimeter. $E_{1\text{ cm.}}^{1\text{ percent}}$ and 480 and 520 $m\mu$. values obtain by the two methods with synthetic and natural α -tocopherols agreed within 5 percent. The values for natural γ -tocopherol were 10 percent lower by the first method and 35 percent lower by the second method. All these compounds were shown to be quantitatively eluted from a magnesia-Supercel adsorbent and showed a maximum loss of 5 percent when shaken with 85 percent sulfuric acid. Tests in which pure synthetic α -tocopherol were added to the extracts and carried through the entire procedure showed an average recovery of 95 percent with both methods. In most cases the results obtained by the two procedures agreed within ± 5 to 10 percent.

Determination of inorganic phosphorus in plant materials, W. A. PONS, JR., and J. D. GUTHRIE. (U. S. D. A.) (*Indus. and Engin. Chem., Analyt. Ed.*, 18 (1946), No. 3, pp. 184-186, illus. 1).—To provide a method of which the results would not be affected by large quantities of proteins or by color or turbidity in the extracts, the authors developed a procedure involving extraction of the inorganic phosphate with 0.75 N trichloroacetic acid, formation of the phosphomolybdate complex in the diluted trichloroacetic acid extract, extraction of the complex with isobutyl alcohol, development of the color by shaking the isobutyl alcohol extract with aqueous stannous chloride, dilution of the blue isobutyl alcohol solution to fixed volume with ethyl alcohol, and measurement of the color against that of a blank by means either of a photoelectric colorimeter or of a spectrophotometer. Color intensity increased slowly during 40 min., then remained constant for 19 hr.

Determination of the cystine and methionine content of plant and animal material by a differential oxidation procedure, R. J. EVANS. (Wash. Expt. Sta.). (*Arch. Biochem.*, 7 (1945), No. 3, pp. 439-445).—The author based a method for the determination of the cystine and methionine content of complex plant and animal products on the differential oxidation procedure of Blumenthal and Clarke (*E. S. R.*, 75, p. 294). The method used consisted of the determination of three sulfur fractions—total sulfur, inorganic sulfur, and the sulfur oxidized to sulfate by heating with concentrated nitric acid. It was shown that cystine sulfur is oxidized to sulfate but methionine is not oxidized by heating with nitric acid in the presence of considerable organic matter.

On the protein basis, the cereals, fish meals, and casein were the best sources of methionine studied, and the cereals, whey, fish meals, soybean oil meal, and cottonseed meal the best sources of cystine. Proteins of peas and the meat scrap were the poorest sources of both amino acids.

Methionine determination in proteins and foods, F. A. CSONKA and C. A. DENTON. (U. S. D. A.). (*Jour. Biol. Chem.* 163 (1946), No. 1, pp. 329-333, illus. 3).—The wavelength of minimum transmission for the red compound formed by the action of sodium nitroprusside upon methionine was found to be 510 $m\mu$. There was a stoichiometric relationship of approximately 2:1 between sodium nitroprusside and methionine in the absence of interfering substances;

but in the presence of other amino acids, especially glycine, the relationship no longer held good. The addition of glycine lessened, but did not eliminate, the interfering color formed by the action of the nitroprusside upon histidine; and glycine itself interfered so seriously, in the absence of a considerable excess of the nitroprusside, as to cause a 74 percent loss in the observed methionine value when 3 mg. of nitroprusside reacted with 1.5 mg. of methionine in the presence of 10 mg. of glycine. Removal of the histidine by precipitation with phosphotungstic acid permitted carrying out the determination without the addition of glycine. Other amino acids remaining in the test solution still invalidated the stoichiometric relationship observed in the treatment of pure methionine solutions with nitroprusside, but consistent methionine values were obtained when aliquots of the protein hydrolysate representing not more than 50 mg. of the protein material were treated with 10 mg. of the nitroprusside. The methionine values thus obtained were also in satisfactory agreement with those given by two other methods.

A simplified extraction-distillation method for the determination of the volatile fatty acids of cheese. K. L. SMILEY, F. V. KOSIKOWSKY, and A. C. DAHLBERG. (Cornell Univ.). (*Jour. Dairy Sci.*, 29 (1946), No. 5, pp. 307-315).—The method described is based on two distillations of acid cheese solution, one dealing with the fat phase and the other with the residual material. After ether extraction of the acid-cheese mixture, the volatile fatty acids were removed from the ether with dilute alkali. The alkali rinses were heated to drive off the ether, then acidified, refluxed to remove carbon dioxide, and distilled in the presence of MgSO_4 , until crystallization occurred. In the meantime, 250 cc. of distilled water were added to the residual material and the solution distilled until 280 cc. of distillate were collected. The sum of the titrations from the two distillations plus that of the alcohol rinse containing the water-insoluble volatile acids deposited in the condenser represented the total volatile acids of the cheese.

The results obtained by the new method agreed closely with those of previous procedure, and had the advantages of requiring no special apparatus, permitting a greater number of distillation per day and greatly reducing the time consumed in the analysis of a cheese sample. In the absence of nonvolatile acids, acetic, butyric, caproic, and caprylic acids were quantitatively recoverable by distillation in the presence of MgSO_4 , as were also capric and lauric acids. Of myristic acid, 71 percent was recovered in such a distillation. Nonvolatile fatty acids, such as palmitic and oleic, exerted a retentive effect on caprylic, capric, lauric, and myristic acids during direct distillation in the presence of MgSO_4 , the degree of retention being in direct relationship to the number of carbon atoms present in the volatile acids. When butyric and caproic acids were distilled, the nonvolatile acids exerted no retentive effect.

Factors influencing estimation of free fatty acids in dried egg powders. L. KLINE and C. M. JOHNSON. (U. S. D. A.). (*Indus. and Engin. Chem., Analyt. Ed.*, 18 (1946), No. 1, pp. 35-38, illus. 1).—The authors note that at the normal pH of dried whole egg, fatty acids liberated during storage are incompletely estimated by the A. O. A. C. procedure for determination of acidity of the ether extract. In addition, the contribution of the extracted cephalin to the acidity of the ether extract may obscure significant percentage increases in the free fatty acidity of the egg powder. The necessity for drying the egg powder as required in the A. O. A. C. procedure is reemphasized. The incompleteness of extraction could be overcome by reconstituting, acidifying to pH 4.5, and drying the egg under reduced pressure while frozen before performing the fat extraction. Acetone precipitation served to remove the greater part of the cephalin. For the complete elimination of this source of error, alcoholic magnesium chloride could be used in conjunction with the acetone treatment.

Determination of carotenoids and lipid amine-aldehyde products in dehydrated egg, H. J. DUTTON and B. G. EDWARDS. (U. S. D. A.) (*Indus. and Engin. Chem., Analyt. Ed.*, 18 (1946) No. 1, pp. 38-41, illus. 2).—A spectrophotometric method for the determination of carotenoid content and a fluorometric method for the determination of ether-soluble brown products in powdered eggs are described. The development of brown lipid substances in stored egg powders was found to introduce errors into the direct photometric measurement of carotenoids. These errors were minimized by the spectrophotometric procedure described, however. Both determinations could be performed upon a single ether extract of egg powder.

Chemical determination of vitamin A in dried whole eggs, C. R. THOMPSON, M. A. EWAN, S. M. HAUGE, B. B. BOHREN, and F. W. QUACKENBUSH. (Purdue Univ.). (*Indus. and Engin. Chem., Analyt. Ed.*, 18 (1946) No. 2, pp. 113-115).—"A chemical method is described for the determination of vitamin A in dried whole eggs by the use of chromatographic adsorption. After a sample is hydrolyzed with alkali and extracted with ethyl ether, the unsaponifiable fraction is adsorbed on a column of calcium hydroxide and the β -carotene, cryptoxanthol, vitamin A, luteol, and zeaxanthol bands are allowed to separate. The provitamins are eluted and determined separately. Antimony trichloride reagent is then added to the combined vitamin A and provitamin A eluates and the amount of blue color determined in a photoelectric colorimeter. Data presented on nine samples of dried eggs show that the values obtained by the chemical method agree within 10 percent with those obtained by bioassay."

Vitamin retention in blanched carrots: Alcohol-insoluble solids as a reference base, F. A. LEE. (N. Y. State Expt. Sta.) (*Indus. and Engin. Chem., Analyt. Ed.*, 17 (1945), No. 11, pp. 719-720).—Experimental results of a study of total solids, alcohol-insoluble solids, and carotene content of raw and blanched carrots are tabulated, together with calculated changes in carotene content as estimated from calculations on the dry weight basis and on the basis of alcohol-insoluble solids. The data show that alcohol-insoluble solids in the carrot are substantially unaltered by blanching in boiling water for periods of 5 to 20 min., whereas total solids progressively decrease (due to solution of water-soluble constituents) with increase in time. Accompanying the great decrease in total solids, the carotene content shows apparent increases when calculated on the dry basis. Expressed on the basis of alcohol-insoluble solids, however, carotene values are relatively constant. The use of alcohol-insoluble solids as a basis for calculating vitamin values for carrots is therefore recommended, and application of this method to other vegetables is suggested. The technic recommended for determining alcohol-insoluble solids involves extraction of the finely ground sample with 80-percent ethyl alcohol under reflux condenser for 30 min., followed by hot filtration through a tared sintered-glass crucible and washing of the residue with hot 80-percent alcohol until the residue is nearly white. Drying is accomplished in an air oven at a temperature of 95° C. for an overnight period.

A comparison of four methods for studying the urinary excretion of thiamine, H. H. GIFFT and H. M. HAUCK. (Cornell Univ.) (*Jour. Nutr.*, 31 (1946), No. 5, pp. 635-645).—"Four normal adults were maintained for 44 days on a controlled diet which was estimated to furnish 600 μ g. of thiamine per 1,000 calories. Basal 24-hr. urinary excretions of thiamine were higher at the first of the period than at the end. Supplements of thiamine given during the pre-experimental period undoubtedly caused elevations in values for the first 2 weeks of the study.

"Four urinary excretion tests for thiamine were studied. Values for 24-hr. excretions of thiamine for the last 4 weeks ranged from 100 to 224 μ g. per day.

Average percentages of thiamine intake excreted ranged from 9 to 13 percent. Responses to a 5-mg. oral test dose at the end of the study ranged from 15 to 22 percent recovery in 24 hr. Responses to 1-mg. intramuscular test doses toward the beginning of the study ranged from 15 to 24 percent recovery. At the end of the study they ranged from 8 to 21 percent recovery, or 193 to 403 μ g. excretion in 24 hr.

"When the urinary excretion values recorded for 'normal' subjects were used as standards for comparison, the nutritional status of these studies with respect to thiamine was not judged to be the same by all four criteria. More data are needed to establish the range of normal values for these urinary excretion tests and their relative sensitivity."

A rapid microdetermination of glycogen in tissue slices, W. J. VAN WAGEN-
DONK, D. H. SIMONSEN, and P. L. HACKETT. (Oreg. State Col.). (*Jour. Biol. Chem.*, 163 (1946), No. 1, pp. 301-306, illus. 1).—The authors describe a microcolorimetric method, adapted to the Klett-Summerson colorimeter, by means of which the glycogen content of samples of tissue slices (liver or kidney) or of muscle strip weighing from 50 to 75 mg. could be determined accurately by measurement of the color developed upon treatment of the glycogen with iodine. As it was possible to carry out both the precipitation of the glycogen and the development of the color in the colorimeter tube, only one transfer was necessary. In liver samples showing mean glycogen contents of 16.1 and of 0.65 percent, respectively, the determination showed standard errors of ± 0.3 and ± 0.02 percent, respectively. In 10 determinations of known quantities of glycogen added to liver slices, the average recovery was 101.6 percent. Good agreement with a standard method was obtained.

Estimation of gossypol in cottonseed meal and cottonseed meats, F. H. SMITH. (N. C. State Col.). (*Indus. and Engin. Chem., Analyt. Ed.*, 18 (1946), No. 1, pp. 43-45, illus. 1).—The authors determined spectral absorption curves for the aniline derivative of pure gossypol and gossypol extracted from cottonseed meal and cottonseed meats with 60 percent alcohol containing ether in the Waring Blendor, these curves representing the difference between the absorption spectra of the aniline derivative of gossypol and of gossypol or gossypol extracts at the same concentration. The absorption curve for the cottonseed meats extract as practically identical with that of pure gossypol except in the region of 380 to 410 $m\mu$. The curve for the cottonseed meal extract was shifted slightly to the right but was very similar to that of pure gossypol. Cottonseed meal samples were extracted by allowing them to stand 10 min. in 30 percent alcohol, then adding sufficient 72 percent alcohol to give a 60 percent alcohol to which ether was added. After treatment for 5 min. in the Waring Blendor, the extracts were filtered and made to 100 cc., and aliquots were taken for the blanks and determinations. The dianilino-gossypol color was developed in the latter by heating after adding aniline, then the percent transmittance was read in a Coleman spectrophotometer, from which the gossypol content was determined. It was concluded that "duplicate determinations of gossypol in cottonseed meal or cottonseed meats may be completed in 2 hr. with readily reproducible results."

Spectrophotometric method for estimating gossypol in crude cottonseed oil, F. H. SMITH. (N. C. State Col.). (*Indus. and Engin. Chem., Analyt. Ed.*, 18 (1946), No. 1, pp. 41-43, illus. 1).—Spectral absorption curves of the dianilino derivative of pure gossypol and that of the gossypol in an expeller and hydraulic crude cottonseed oil are given. A rapid spectrophotometric method having an accuracy and precision approaching that of the gravimetric method for estimating the gossypol content of crude cottonseed oil is presented. The time required for the analysis is given as less than 2 hr.

Determination of menthol in peppermint oil: Acetic anhydride and pyridine as reagent, J. S. JONES and S. C. FANG. (Oreg. Expt. Sta.) (*Indus. and Engin. Chem., Analyt. Ed.*, 18 (1946), No. 2, pp. 130-131).—A procedure very satisfactory with regard to rapidity and reproducibility of results was based upon the utilization of a mixture of acetic anhydride and pyridine. The necessary acetylation period was somewhat longer for menthol than was required by the microprocedure with the same mixture for other alcohols unaccompanied by such a mixture of compounds as that which characterizes peppermint oil. The requirement for acetic anhydride was at least 100 percent in excess of the theoretical quantity. Since the menthol content of peppermint oil varies with the several factors pertaining to production and time of harvesting, it was necessary to add a substantial excess of this reagent. The proportion of pyridine used could be varied within a rather wide range, but the ratio of acetic anhydride to pyridine could not be greater than 1 : 1. A wider ratio necessitated a longer acetylation period. For peppermint oils containing free acid, the values thus obtained should be corrected. The proposed procedure was found to be substantially less time-consuming than preceding acetylation methods for determining free menthol, more economical of reagents, and capable of yielding results more closely in agreement among themselves.

Rapid photometric methods for determining rubber and resins in guayule tissue and rubber in crude-rubber products, H. P. TRAUB (*U. S. Dept. Agr., Tech. Bul.* 920 (1946), pp. 37, illus. 16).—Rapid semimicrophotometric methods for the determination of rubber and resins in small samples of guayule tissue are described. These procedures could also be adapted for other rubber- and resins-bearing plants, and the analysis of synthetic rubbers, and were adapted for the determination of rubber in crude-rubber products.

The methods are based on the following principles: (1) Grinding the properly dried tissues or cutting the product to the required degree of fineness to permit quantitative extraction of rubber or resins; (2) using oxygenated solvents (ketones, acetates, etc., for rubber; and acetonylacetone, cellosolve, etc., for resins) with relatively high boiling points (115.8° to 230.7° C.), alone or in mixture, that permit the rapid extraction of rubber or resins in 20 to 30 min. at relatively high temperatures (115° to 120°); (3) precipitating the rubber or resins from aliquots of the solutions by means of suitable precipitants (acidified ethanol for rubber and acidified water for resins); (4) making photometric readings of percentage of light transmittance after rubber or resins precipitation at a wave length that eliminates the error due to extraneous color (the determination relying on the development of a uniform turbidity rather than a color for purposes of analysis); and (5) securing this uniform turbidity, or required degree of precision, by making the photometric readings at standing times (during which the readings are relatively stable) based on the concentrations of rubber or resins precipitated.

Differentiation of rubber and gutta hydrocarbons in plant materials, S. B. HENDRICKS, S. G. WILDMAN, and E. J. JONES. (U. S. D. A.). (*Arch. Biochem.*, 7 (1945), No. 3, pp. 427-438, illus. 3).—As comparison standards, the authors used rubber obtained from *Hevea brasiliensis* latex as the polymerized hydrocarbon of the cis-configuration, and balata gutta (from *Mimusops balata*) as a representative polymer of the trans-configuration. After removal of nonrubber substances by anaerobic bacterial action, the dried coagulum from the *Hevea* latex was several times dispersed in benzene and precipitated with acetone. The balata polymer was purified by first extracting a sheet of balata with hot water, then dispersing in benzene, centrifuging, precipitating with acetone, and recrystallizing from petroleum spirit. Compared in the infra-red wave-length range, these preparations

showed a clear-cut differentiation, the relative absorption coefficient of the rubber polymer being 42 percent greater at 12μ than was that of the gutta.

Hydrocarbons of the rubber (r) or gutta (g) types isolated from *H. brasiliensis* (r), *M. balata* (g), *Asclepias erosa* (milkweed (r)), *A. syriaca* (milkweed (r)), *Oenothera biennis* (evening-primrose (r)), *Solidago leavenworthii* (goldenrod (r)), *Eucommia ulmoides* (g), *Euonymus japonicus* (g), and *Jatropha* sp. (chilte (r)) were positively identified by their infra-red absorptions near 12μ . Mixed cis- and trans-isomers were absent in all cases even though the plants examined were selected as giving hydrocarbon polymers of questionable types.

Chemical methods for analysis of dichloro-diphenyl-trichloroethane (DDT), J. M. GINSBURG. (N. J. Expt. Stas.) (*Jour. Econ. Ent.*, 39 (1946), No. 2, pp. 174-177).—The principal reactions of eight chemical methods now being investigated for analyzing DDT in spray residues and insecticide mixtures are briefly reviewed.

The determination of DDT: A review of analytical methods for the determination of DDT in the technical and pure compounds and in various insecticides, by total chlorine procedures, C. G. DONOVAN. (U. S. D. A.). (*Soap and Sanit. Chem.*, 22 (1946), No. 6, pp. 165, 167, 201).

Accelerated aging test for insecticidal aerosols containing DDT, L. D. GOODHUE and W. R. BALLINGER. (U. S. D. A.). (*Indus. and Engin. Chem., Analyt. Ed.*, 18 (1946), No. 2, pp. 131-132, illus. 1).—The authors note that the introduction of DDT into the liquefied-gas aerosol has created the problem of stabilizing the aerosol solution and preventing corrosion of the container. The ease with which hydrochloric acid is liberated from DDT in the presence of some iron salts has made necessary the development of an accelerated aging test for studying the effect of the different aerosol constituents on this reaction. A simple pressure test tube and a method of running a test are described. The rate of decomposition was found to vary greatly, depending mostly on the solvents used. Some of the solvent combinations studied appeared to be satisfactory.

Quantitative determination of phenolic fungicides, S. GOTTLIEB and P. B. MARSH. (U. S. D. A.). (*Indus. and Engin. Chem., Analyt. Ed.*, 18 (1946), No. 1, pp. 16-19, illus. 5).—The color reaction of 4-aminoantipyrine with the textile mildew-preventive 2,2'-methylenebis[4-chlorophenol] in the presence of potassium ferricyanide and dilute sodium carbonate was found adaptable to quantitative analysis for this phenolic material and was used for its determination in fabric. Absorption curves and standard calibration curves for several other commercially important phenols are given, with the suggestion that this color reaction may find application in the quantitative determination of many phenolic fungicides, germicides, and other materials.

The product of the reaction is represented as of an indophenol type, but it is pointed out that an apparently similar color formation takes place in reaction with phenols having the 4-position blocked. These instances may involve formation of an orthoquinoid structure.

Biological stains: A handbook on the nature and uses of the dyes employed in the biological laboratory, II, J. CONN (Geneva, N. Y.: *Biotech Pubs.*, 1946, 5. ed., rev., pp. 346, illus. 4).—In preparing this fifth edition of the work previously noted (*E. S. R.*, 80, p. 163), the text has been largely rewritten. Cross references are given throughout the book to the loose-leaf manual *Staining Procedures Used by the Biological Stain Commission*,^a thus rendering it easy to find

^a H. J. Conn and M. A. Darrow. Geneva, N. Y.: *Biotech Pubs.*, 1943, pt. 1, Sects. A-D, pp. [130]; 1944, pts. 2, Sects. A-B, pp. [32]; 3, Sects. A-B, pp. [39].

where to locate any detailed staining procedure in which any one of the dyes herein described is employed.

Progress in the standardization of stains, H. J. CONN (*Stain Technol.*, 21 (1946), No. 3, pp. 81-86).—This is a review of the 25 yr. of cooperation with the U. S. Department of Agriculture and includes the beginnings of stain investigations in the United States, organization of the work under the National Research Council, organization of the Stain Commission, and the early and more recent phases of the cooperation. The author expresses the "appreciation of the Commission to the Department of Agriculture for a quarter century of active and invaluable cooperation."

AGRICULTURAL METEOROLOGY

Trees in two climates, W. H. CHANDLER (*Berkley: Univ. Calif. Press; London: Cambridge Univ. Press*, 1945, pp. 22+).—A lecture on climatic factors in relation to the life of trees, including cold hardiness and the mechanisms of injury by low temperatures and of the chilling or other requirements for breaking the rest period in warm and cold climates. There are 33 references.

Spring frosts with special reference to the frosts of May 1935, W. R. DAY and T. R. PEACE ([*Gt. Brit.*] *Forestry Comm. Bul.* 18 (1946), 2, ed., pp. 111, illus. 41).—Experiences during the 9 yr. since the first edition of this bulletin was first published (*E. S. R.*, 78, p. 11) are said to confirm fully the importance of frost as a cause of disease in trees in Britain. The exotic conifers have continued to provide the more extreme examples of susceptibility among species of economic importance to forestry. It is believed that sufficient examples have been given to convince the reader that the relationship between topography, frost intensity, and damage to young trees is by no means simple. It is shown that topography, by checking or promoting the flow of cold air, plays an important role in regard to frost intensity; the degree of damage, however, often depends more on the developmental stage of the buds at the time of the frost than on the local air currents. The bud stage, in its turn, may be affected by aspect and degree of slope, thus bringing the argument back again to topography. Other factors, such as the relationship of slope to soil conditions, which in turn may affect the rate at which a young tree grows out of the frost zone, exposure to the morning sun, and shelter from the wind, must also be borne in mind. It is from the interaction of some or all of these factors that the cause of any given case of frost damage must be sought.

Detailed findings and conclusions of the studies are presented. Following an introductory section, the subject matter is discussed under the temperature of the ground air zone and factors affecting it, nature of late frost injury to trees and shrubs, occurrence, distribution, and relative severity of the May frosts of 1935, stage of development of trees at the time of the frosts, damage to trees and shrubs, and silvicultural aspects of shelter against frosts. Appendixes take up the late frosts in 1935 and the weather conditions associated with them and the influence of topography on severity of frost. A two-page bibliography is provided.

1945 weather conditions detrimental to the fruiting of grape vines, W. K. STREUK (*Ohio Sta. Bimo. Bul.* 240 (1946), pp. 88-91).—A combination of winter-killing, frost, and shelling greatly reduced the 1945 grape crop. Not all varieties were equally susceptible to weather conditions, viniferous hybrids proving more resistant than the labruscan types.

Researches in dendrochronology, A. E. DOUGLASS. (Univ. Ariz.) (*Utah Univ. Bul., Biol. Ser.*, 10 (1946), No. 1, pp. 19, illus. 17).—The Laboratory of Tree-Ring Research of the University of Arizona has developed a new source of climatic

data in the rings of properly located trees and a new method of cyclic analysis especially adapted to handling climatic changes. These two features seemed to the author to open a gateway through which perhaps long-range forecasting might advance. The purpose of this paper is therefore to give the climatic basis of the tree-ring records studied which make them proper material for studying climate, the extent of these records in time and space, and a survey of the methods and advantages of the cyclic analysis used. The subject matter is discussed under the tree-ring basis of the climatic data, length of the near-climatic records, building a chronology into past climates, geographical areas of the near-climatic records, cyclic analysis of climatic records, and tree rings and forecasting. In conclusion the author states that "perhaps this is one of the first attempts to describe generally the unstable periodicities or cycles that make up our climatic changes. It is but a beginning, but it may be on the right track. The writer feels that in these cycles there may be found a real basis for forecasting."

Tree ring studies in North Dakota, G. F. WILL (*North Dakota Sta. Bul.* 338 (1946), pp. 24, illus. 7).—Based on a study of the number and width of annual rings shown in cross sections of old logs, timbers, fence posts, and a few old living trees, the author prepared a tree-ring chart covering a long period of years. Correlated with reliable weather records of recent years this chart gave a long-time picture of precipitation in various parts of North Dakota. The longest wet period was 39 yr. and the longest dry period was 16 yr. There appeared to be no definite cycles. Long periods of drought were followed by either long or short wet periods. It appeared that more than half of all the years were wet enough to discourage irrigation, making the area marginal with respect to use of irrigation. Although irrigation facilities would be desirable, they should be of a type that would not carry a large overhead expense in favorable years.

Insects and weather—a discussion at a joint meeting of the Royal Entomological Society of London and the Royal Meteorological Society held on 20th June 1945 (*Roy. Met. Soc. [London], Quart. Jour.*, 71 (1945), No. 309–310, pp. 221–230, illus. 3).—The following brief papers—with general discussion—are presented: Phenological Relationships of Meteorology and Entomology, by H. C. Gunton (pp. 221–222); Fluctuations in Insect Populations as Related to Weather Conditions, by C. B. Williams (p. 222); Vertical Air Currents as Agents of Insect Dispersal, by A. E. Slater (pp. 223–226); and The Organisation of Bioclimatic Research, by B. P. Uvarov (pp. 226–228).

The meteorological control of atmospheric pollution by heavy industry, E. W. HEWSON (*Roy. Met. Soc. [London], Quart. Jour.*, 71 (1945), No. 309–310, pp. 266–282, illus. 13).—This paper describes a method of reducing atmospheric pollution by varying the emission of offending material with meteorological conditions; the details of application of the technic where the problem was to prevent damage by SO₂ to vegetation are presented. An investigation of the distribution of winds and SO₂ in the Columbia River Valley near Trall, B. C.—where the investigation was made—indicated that during the growing season the majority of the fumigations are brought about by differential heating of the valley sides by the sun. Measured values of atmospheric turbulence and of wind speed and direction are fundamental in the control regime prescribed in this case. The possibility of applying the same principle to other situations, and especially over level country, is discussed.

SOILS—FERTILIZERS

Sergei Nikolaevitch Winogradsky, September 1, 1856–August 31, 1946: The story of a great bacteriologist, S. A. WAKSMAN. (N. J. Expt. Stas.) (*Soil Sci.*, 62 (1946), No. 3, pp. 197–226, illus. 1).—This is a biographical sketch

of this distinguished microbiologist, who died August 31, 1946, on the eve of his ninetieth birthday. A list of about 60 publications is appended.

Bibliography of soil science, fertilizers, and general agronomy, 1940-44 (*Harpden, Eng.: Imp. Bur. Soil Sci., 1946, pp 567+*).—This comprehensive volume covers 4 yr. of contributions to soil science. It serves as a cumulative index to *Soils and Fertilizers*, volumes 4 to 7. Material is presented by author and subject matter.

Environmental factors and their control in plant experiments, M. W. PARKER (U. S. D. A.). (*Soil Sci., 62 (1946), No. 1, pp. 109-119, illus. 1*).—The author notes that of the various environmental factors that affect the growth of plants in greenhouses, the light duration or photoperiod and such conditions of the soil as temperature, moisture, aeration, reaction, and nutrients can readily be controlled. The factors of air temperature, humidity, and composition are the most difficult to control because of the constantly and widely changing outside environment, and for control within a narrow range air-conditioning of a greenhouse or construction of controlled-environment rooms is necessary. The construction of chambers has been greatly facilitated by the development of fluorescent-type lamps, and the improvements in air-conditioning equipment have made it possible to condition small greenhouses satisfactorily. If the prevailing climate affords ample sunlight for extended periods, small air-conditioned greenhouses are to be recommended for most experiments, since no artificial source of illumination has been developed that is equivalent to sunlight.

It is emphasized that plant growth is dependent upon all the factors that make up the environment. No particular level of one factor should be referred to as the optimum for growth of a species without specifying at least the approximate levels or conditions of the other important components of the environment. No single optimum for any factor exists that will hold without regard to the status of other factors.

Pot method for soil cultures, W. H. MACINTIRE and S. H. WINTERBERG. (Tenn. Expt. Sta.). (*Soil Sci., 62 (1946), No. 1, pp. 33-41, illus. 4*).—The authors discuss equipment (buildings, tables and transfer trucks, and pot cultures) and operative technic (under which are included soil selection and preparation, fertilizing and liming, and growing and harvesting).

Growing plants in sand cultures for experimental work, W. R. ROBBINS. (N. J. Expt. Stas.). (*Soil Sci., 62 (1946), No. 1, pp. 3-22, illus. 1*).—"It is not the purpose of this discussion to record all the variations of the sand-culture method, but rather to describe certain equipment and to discuss briefly in comparison with several other technics some of the factors concerned with a technic of continuous solution renewal which has proved satisfactory in this laboratory for the production, in individual sand cultures, of plants excellent in size, productivity, and sensitivity to environmental changes induced by the investigator." To this end, the author discusses the choice of an experimental plant suitable to the conditions and purposes of the experiment; culture equipment, of which the author favors the simpler forms; culture vessels, among which he recommends a pot of high-grade white porcelain with over-all silica glaze, considered to be chemically resistant, strong, a good reflector of sunlight, and free from the tendency to develop the fine cracks through which salts may penetrate and remain as a source of contamination; the sand, which must be white quartz of a high degree of purity for critical work, and should be of closely graded particle size; jars to serve as nutrient-solution reservoirs; nutrient-solution delivery tube; plant, culture vessel, and reservoir supports; waste pan; preparation of equipment for use; preparation of plant material; choice of nutrient solution; preparation of nutrient solutions; application of nutrient solution; and atmospheric conditions.

Colloidal clay cultures: Preparation of the clay and procedures in its use as a plant growth medium, W. A. ALBRECHT. (Mo. Expt. Sta.) (*Soil Sci.*, 62 (1946), No. 1, pp. 23-31, illus. 3).—The procedure described is that of the separation from a suitable soil of its finer clay fraction (less than 0.2μ particle diameter, electrodialysis of this clay, adsorption of known quantities of plant nutrients upon the clay, and the growing of the experimental plants upon mixtures of the prepared clay colloid with quartz sand. Topics considered in the discussion are the separation of the colloidal clay (its source in the soil, its mechanical dispersion, its centrifugal separation); the electrodialysis of the clay (the cathode and its cell, the anode and its cell, continuous operation of the cell, and the rate—from 400 to 500 gm. of colloidal clay in a week of continuous operation of the cell described—of the electrodialyzed product); standardization of the clay suspension; the preparation of the plant-growth media from the clay (calculation of the quantities of the clay and nutrients needed and nitration of the nutrients on the clay); and the accuracy of fertility control permitted by the colloidal clay culture method.

Modified Mitscherlich method for soil cultures, R. J. BORDEN. (Hawaii. Sugar Planters' Expt. Sta.). (*Soil Sci.*, 62 (1946) No. 1, pp. 51-60, illus. 1).—The author describes a modified Mitscherlich method (E. S. R., 49, p. 815), used more especially for phosphate and potassium, which has been applied extensively to sugarcane soils in Hawaii. Changes in the original method were chiefly concerned with the indicator crop, the soil dilution, the quantity of phosphate supplied to insure maximum growth, and the use of a specific weight of soil in each pot. The procedure now used is described, and an outline of the treatments used in the complete standard test is given. The method of calculating an "acre-foot soil factor," used in correcting the values found in the Mitscherlich tables, is shown, and an example giving the calculations involved in finding the basic ratios for reference to the Mitscherlich tables is explained. A discussion is included of certain factors that can influence these basic ratios. A table of qualitative groupings for the results from this method of testing soils accompanies a discussion of the manner in which the results are interpreted when recommendations are made for the fertilization of the cane areas from which the soil samples were made.

Modified Neubauer method for soil cultures, W. T. McGEORGE. (Univ. Ariz.). (*Soil Sci.*, 62 (1946), No. 1, pp. 61-70, illus. 5).—From a detailed and extended study of the effects of various modifications of the original procedure, the author concludes that with modifications to suit laboratory or greenhouse temperatures, preferably not over 22°C ., the Neubauer method (E. S. R. 53, p. 319) offers a procedure for the examination of the fertility of the soil in which the plant is used as an indicator. Most important is the observation that at this temperature the Neubauer method can be further modified to the extent that the method becomes an important research tool for the study of plant nutrition and especially the growth-limiting factors that are always present in greater or less degree in semiarid soils.

Like chemical soil analysis, the Neubauer method is an empirical method, and therefore adherence to the 100 : 100 ratio of weight of soil to number of seedlings is essential for obtaining Neubauer values. As a research tool in the study of soil and nutritional problems, it is advisable to vary this ratio or absolute weight of soil and number of seedlings in order to get a broader knowledge of the inherent soil conditions being studied. With the same technic, many seedlings other than rye can be grown on a quantitative basis where one desires to study the growth-limiting factors for other seedlings.

A modification of the method which has given entirely satisfactory results at the Arizona Experiment Section for more than 10 yr. is given in working detail.

Large-scale soilless culture for plant research, O. W. DAVIDSON. (N. J. Expt. Stas.). (*Soil Sci.*, 62 (1946), No. 1, pp. 71-86, *illus.* 4).—From extensive experience of the method, the author finds that the use of large artificial cultures in plant research offers a degree of control over inorganic nutrition not attainable with soil. It also permits economy of time in growing large numbers of plants as well as large quantities of plant material. The choice of one method of artificial culture over another should depend upon the requirements of the individual investigation. Thus, solution cultures offer the highest degree of control over the composition of the nutrient substrate. They also permit convenient access to roots, as for sampling and making observations. Sand cultures permit greater ease of growing and supporting plants than do solution cultures, but at some sacrifice in refinement of nutrient control. Gravel culture offers about the same degree of control over the composition of the substrate as does the sand method. Depending upon the frequency of the pumping or flooding cycle, the changes occurring in nutrient concentration about the plant roots may be even less than in sand. Gravel cultures furnish the most favorable conditions of root aeration with a minimum of attention.

Arrangement of soil series and types according to functions of soil-forming factors, H. JENNY. (Univ. Calif.) (*Soil Sci.*, 61 (1946), No. 5, pp. 375-391, *illus.* 9).—On the basis of a generalized equation relating soil-forming factors, five groups of pedologic functions are recognized. Criteria for evaluating in a given area the dominant and subdominant soil-forming factors are stated. Soil series and types are arranged in five sequences: Chronosequences, lithosequences, toposequences, climosequences, and biosequences. The relationships of these sequences to Bushnell's multiple catenas (E. S. R., 91, p. 644) and Thorp's families (E. S. R., 88, p. 163) are brought out. The genetic classification of soil series is held to constitute a 5-dimensional network of series, each being linked, in principle, to 10 other series.

A pedologic study of California Prairie soils, I. BARSHAD. (Univ. Calif.) (*Soil Sci.*, 61 (1946), No. 6, pp. 423-442, *illus.* 5).—It is shown that the California Prairie soils and the midwestern Prairie soils are very similar in many soil properties, although the soil-forming factors are not identical. The similarity of the soils suggests that certain properties of the soil-forming factors of the two geographic regions must be alike, and dominant in determining certain soil properties. An evaluation of the soil-forming factors of the two regions led to the conclusion that the dominant properties among the soil-forming factors for the prairies investigated are (1) climate, classified for both regions as sub-humid; (2) organisms, a dense ground cover of either grass or shrubs; (3) topography, upland with good drainage conditions; (4) time or age, fairly advanced (a considerable range for the midwestern Prairies); (5) parent material, the one dominant property is the relatively high calcium and magnesium content (4.4 to 13.1 percent).

Relation of parent material and environment to the clay minerals in Iowa soils, J. B. PETERSON. (Iowa Expt. Sta.) (*Soil Sci.*, 61 (1946), No. 6, pp. 465-475, *illus.* 5).—From differential thermal analysis, X-ray diffraction pictures, and analysis of base-exchange capacity, it was found that Iowa soils with parent material of Pleistocene origin, which includes most of the soils of the State, are characteristically high in montmorillonite. The proportion of montmorillonite to kaolinite in these profiles was found, however, to vary according to climate, vegetation, and source and age of the parent material. The profiles studied indi-

cate that there is little difference between the A and B horizons of either Prairie or Wiesenboden soils of the Wisconsin drift in respect to the kinds and amount of clay minerals in the clays. Generally in soils on older Pleistocene materials the proportion of montmorillonite to kaolinite was lower in the A and higher in the B, this shift being greater in the Gray-Brown Podzols and Planosols than in the Prairie soils. There was also evidence that the increase in montmorillonite in the clay of the B horizon was greater in areas of greater rainfall.

Some properties of Wasatch Mountain Soils, A. R. CROFT and J. P. THORNE. (U. S. D. A.) (*Utah Acad. Sci. Arts. and Letters, Proc.*, 21 (1943-44), p. 6).—The authors point out some relations of such soil properties as texture, organic matter content, and reaction or pH, with site factors such as aspect of slope, elevation, plant type, and degree of accelerated erosion. Composite soil samples were taken at two depths (0-1 and 1-6 in.) on six minor watersheds tributary to Farmington Creek. Soils to a depth of 6 in. were found to be coarse textured, relatively high in organic matter, and definitely acidic. Differences in soil properties on the north, east, and west aspects were small. Decreasing percentages of silt and organic matter and decreasing pH were found to be associated with increasing elevation. Browse species appeared to favor a less acid soil and a better incorporation of organic matter into the soil than did aspen-fir cover. Within browse and aspen-fir areas pH values were found to be almost normally distributed. Soils in the severely eroded areas were coarser in texture and contained but one-half as much organic matter as did those in the noneroded areas.

Seasonal variability in the aggregation of Hagerstown silt loam, R. B. ALDERFER. (Pa. Expt. Sta. coop. U. S. D. A.). (*Soil Sci.*, 62 (1946), No. 2, pp. 151-168, illus. 2).—Soil structure, measured by the percentage of the soil aggregated into particles >0.25 mm. in diameter on the basis of 105° C. oven-dry weight, was subject to wide seasonal variations. In its field-moist condition, the soil had a minimum percentage of water-stable aggregates during the hot, dry period (July and August) and maxima in November and in February. Soil moisture content was closely related to the percentage and size of water-stable aggregates when the soil was analyzed in its field-moist condition. The effect of soil moisture content was modified, however, by such seasonal conditions as alternate wetting and drying during the summer and by alternate freezing and thawing. These influences effected a large but temporary increase in aggregation during the late winter. Laboratory air-drying effected a marked change in the size and quantity of water-stable aggregates as compared with the aggregate distribution in the soil at its actual field moisture content. In the air-dry condition the soil had a maximum percentage of water-stable aggregates during July, August, and September and a minimum during the winter and early spring months. Aggregation varied markedly in the several layers of surface soil under different treatments. Aggregation was greatest in the 1-3-in. surface layer of the tilled soils in which various materials were incorporated, whereas the 0-1-in. layer possessed the least quantity of the larger aggregates. Aggregation of the 3-6-in. surface layer was generally slightly less than that of the 1-3-in. layer. The 0-1-in. layer was somewhat less aggregated, and the 3-6-in. layer remained almost wholly unaffected by the presence of the surface mulch.

Physical land conditions in Anderson County, South Carolina, E. A. BURGESS ET AL. (U. S. Dept. Agr., *Soil Conserv. Serv., Phys. Land Survey No. 38* (1946), pp. 46+, illus. 17).

Observations on alkali soils in Iran, D. W. PITTMAN. (*Utah State Agr. Col. (Utah Acad. Sci., Arts, and Letters, Proc.*, 21 (1943-44), pp. 97-99).—The author found that in Iran, as in most desert countries, one of the chief soil problems is alkali. The valley soils are predominantly of the gray desert type and in

many places are so rich in salt that after 1 or 2 yr. of irrigation the lands becomes worthless. Some rather extensive development projects have failed for this reason. Several instances of this sort are described. The "alkali" found was nearly always salinity only, the soil reaction being rarely more alkaline than pH 8.5. The saline material consisted mostly of a mixture of sodium sulfate and chloride in the ratio of about 3 to 1. At one point, however, the author found a soil containing such an excess of nitrates as to give off abundant fumes of nitrogen peroxide when heated with acid to determine its content of organic matter. The native reclamation method was found to be that of flooding and then permitting the water to run off, with or without the growing of a rice crop during the period of flooding. An instance of the very successful use of this method, in conjunction with surface drains, is described.

Early investigations dealing with water runoff and soil erosion, M. F. MILLER. (Univ. Mo.). (*Jour. Amer. Soc. Agron.*, 38 (1946) No. 7, pp. 657-660, illus. 2).—This historical note concerns preliminary work already reported upon in 1923 (E. S. R., 51, p. 210) and in 1932 (E. S. R., 69, p. 118).

Displacement of soil-air by CO₂ for permeability tests, J. E. CHRISTIANSEN, M. FIREMAN, and L. E. ALLISON. (U. S. D. A. et al.) (*Soil Sci.*, 61 (1946), No. 5, pp. 355-360, illus. 2).—The experiment reported herein indicates that the air which is normally entrapped within a soil upon wetting can be eliminated by displacing it with the much more soluble gas, carbon dioxide, prior to wetting. When this is done, the permeability is at a maximum at the beginning of the test or shortly thereafter. Where it is desirable to determine the permeability rates for complete saturation, this technic eliminates the necessity of long-time tests. For subsoils, sands, and structureless materials, in which the decrease in permeability is very gradual, the initial permeabilities of the CO₂-treated samples were found approximately the same as the maximum permeabilities for the untreated samples, which are obtained only after a period of a few to many days. In surface soils, however, the initial rates for the CO₂-treated samples were appreciably higher than the maximum rates reached by the untreated samples. The technic described here is believed to have special time-saving value in connection with permeability tests for drainage studies and other engineering purposes where the permeability of completely saturated materials is desired.

Relation of moisture tension to heat transfer and electrical resistance in plaster of paris blocks, H. R. HAISE and O. J. KELLEY. (U. S. D. A.) (*Soil Sci.*, 61 (1946), No. 5, pp. 411-422, illus. 8).—Calibration curves relating moisture tension to electrical resistance and heat transfer in gypsum plaster blocks of the type designed by Bouyoucos and Mick (E. S. R., 83, p. 307) for the measurement of soil moisture percentage are presented. The errors and difficulties encountered in making these calibration curves by means of a pressure-membrane technic are discussed. A desorption curve determined for gypsum plaster indicated that most of the moisture is held at tensions below 4 atmospheres.

The influence [of] incubation temperature on the microbiological activities in some soils, L. W. JONES and J. E. GREAVES. (Utah State Agr. Col.) (*Utah Acad. Sci., Arts, and Letters, Proc.*, 21 (1943-44), pp. 75-78).—Soils incubated at varying temperatures in the determination of numbers, ammonifying nitrifying, and nitrogen-fixing powers showed different optimum temperatures. In all but one soil the optimum temperature for the maximum bacterial counts was 30° C. In the one exceptional soil this optimum temperature occurred at 20°. The optimum temperature for ammonia accumulation was between 40° and 50°. The optimum for nitrate accumulation varied. In some soils it was 20° and in others it was 30°. In all soils it was lower than for optimum ammonia accumulation. Nitrogen fixation proceeded at a measurable rate at 10° and became quite

active at 20°. It reached its maximum at 30°. Nitrification was often stopped at 40°. Nitrogen fixation was seldom stopped at this temperature, and ammonification never in the soils tested.

Alfalfa decreases in the Black Belt with decreases in soil fertility, H. B. VANDERFORD (*Miss. Farm Res. [Mississippi Sta.], 9 (1946), No. 3, p. 2*).—The failure of alfalfa to grow on soils where it had been grown successfully for years in the Black Belt section of Mississippi was found to be closely associated with a decline in soil fertility. Results from an experiment started in 1926 indicated that manure and phosphate supplied the needed elements. In recent years it has been found that boron and potash are also necessary for efficient alfalfa production on some soils.

Effects of organic residues and nitrogen fertilizers on a semiarid soil, V. T. SMITH, L. C. WHEETING, and S. C. VANDECAVEYE. (*Wash. Expt. Sta. (Soil Sci., 61 (1946), No. 5, pp. 393-410, illus. 3)*).—Conditions and methods having been outlined under the heads of climate, soil and plot arrangement, and harvesting, sampling, and analysis methods, the authors give their results as grain yields, nitrogen content of the wheat, yields and nitrogen contents of the straw, available soil moisture, soil nitrate-nitrogen content, and changes in the organic carbon and in the nitrogen content of the soil.

During the treatment period (1922-40), the soil treatments described produce no marked increase or decrease in the yield or bushel weight of wheat. The nitrogen content of the wheat was increased by the manure treatment, by treatments of ammonium sulfate alone, and by treatments of straw with ammonium sulfate. Grain from the plots receiving ammonium sulfate alone had the highest nitrogen content, followed in descending order by the grain from treatments of 100 lb. ammonium sulfate with 1,600 lb. straw, 50 lb. ammonium sulfate with 800 lb. straw per acre, and of manure alone. The yields of straw were greatest on the plot receiving 100 lb. of ammonium sulfate with 1,600 lb. of straw per acre, followed in order by the treatments of 50 lb. of ammonium sulfate with 800 lb. of straw, 3,200 lb. of straw alone, 100 lb. of ammonium sulfate alone, 7,000 lb. of manure, 50 lb. of ammonium sulfate alone, 1,600 lb. of straw alone, and 800 lb. of straw alone. Numerous like data are discussed, summarized, and tabulated.

Effect of different sources of nitrogen on soil reaction, exchangeable ions, and yields of crops, N. J. VOJK and J. W. TIMMORE. (*Ala. Expt. Sta. (Soil Sci., 61 (1946), No. 6, pp. 477-492)*).—Fertility plots established in Alabama in the period 1928 to 1930 were studied to determine the long-time effect of various sources of nitrogen on the chemical composition of several soils and on the yields of seed cotton and corn. Samples of soils taken from the plots of the nine different sites in 1941 were analyzed for soil reaction and for exchangeable hydrogen, calcium, magnesium, and potassium.

On most sites, the nonacid-forming sources of nitrogen, except cyanimid, were definitely superior to the acid-forming sources for the production of cotton and corn when acidity was not corrected, producing an average of about 100 lb. of seed cotton and 3 bu. of corn more per acre. When the acidity of the acid-forming fertilizers was corrected, however, these differences were eliminated at most sites. Results at most sites were inferior with calcium cyanamid. A mixture consisting of three-fifths to three-fourths of the nitrogen as sodium nitrate and two-fifths to one-fourth as ammonium sulfate gave the greatest average returns of seed cotton. Sodium and sulfur may have been responsible for the increase, but the difference in returns between this mixture and some other sources of nitrogen were not great. When dolomite was added to acid-forming fertilizers, the average yield of seed cotton was increased 143 lb. per

acre and of corn 3.8 bu. per acre over an 11- to 13-yr. period, and, when added to nonacid-forming fertilizers, the average yield of seed cotton was increased 83 lb. per acre and of corn 2.3 bu. Part of the increase is held undoubtedly to have been due to the magnesium in the dolomite. Numerous further observations and conclusions of a like nature are detailed.

Chemical relationships of potassium and magnesium in organic and sandy soils of central Florida, V. C. JAMISON. (Fla. Expt. Sta.) (*Soil Sci.*, 61 (1946), No. 6, pp. 443-453, illus. 2).—This paper is concerned with sandy ridge soils, light, of poor fertility, and of very low exchange capacity (about 2 milliequivalents per 100 gm. in the surface, and about 1 m. e. in the subsoils), used for citrus plantings because they are less susceptible to cold injury than are surrounding areas of lower level. Of its low exchange capacity, Norfolk fine sand, for example, lost more than four-fifths on removal of its organic matter by oxidation. It was found that although the pH is a factor in the retention of potassium in light sandy and organic soils of Florida, potassium retention in these soils is so weak as to make pH of little practical consequence. On the other hand, magnesium was more strongly adsorbed, and the pH of the soil and the presence of unreacted lime residues were of great significance in magnesium conservation. Practically no fixation of potassium in nonexchangeable form was observed. Potassium accumulated from applications only temporarily when there were droughty periods. When the rains came again, that which had accumulated was leached.

The comparative effects of lime and gypsum upon plants grown on acid soils, M. FRIED and M. PEECH. (Cornell Univ.) (*Jour. Amer. Soc. Agron.*, 38 (1946), No. 7, pp. 614-623).—Barley, perennial ryegrass, and alfalfa were used as the test crops. The plants grown on limed soils absorbed much more calcium and gave much higher yields than those grown on gypsum-treated soils despite the higher concentration of calcium in soil solution in the gypsum-treated soils. For some reason not yet determined, the plants were unable to absorb calcium from the acid soil even when supplied with an adequate quantity of soluble calcium salt. There was good indication that manganese, which was absorbed readily by all plants, may have prevented the uptake of calcium. For example, an application of 200 lb. of manganese, as $MnCO_3$, per 2,000,000 lb. of soil to an acid soil virtually prevented the growth of alfalfa. It is pointed out that this quantity of manganese is not much in excess of the quantities usually found in acid soils in exchangeable and water-soluble forms. Liming reduced the manganese content of all the three crops investigated and decreased the aluminum content of alfalfa. An application of 50 lb. of iron, as $FeSO_4$, per 2,000,000 lb. of soil appreciably reduced the yield of perennial ryegrass without affecting the iron content of the plants. The quantities of iron and phosphorus in the plants were relatively unaffected by any of the treatments. It is noted that these results indicate that the poor growth of plants on acid soils is not necessarily due to the lack of an adequate supply of calcium, but that the response of crops to lime on acid soils is quite complex, involving several contributing factors such as toxicity of manganese, iron, and aluminum, the relative significance of which probably varies with different crops and soils.

Absorption of calcium by peanuts from kaolin and bentonite at varying levels of calcium, A. MEHLICH and W. E. COLWELL. (N. C. Expt. Sta.) (*Soil Sci.*, 61 (1946), No. 5, pp. 369-374, illus. 2).—Relatively pure colloidal material of the 1:1 and 2:1 lattice types was used. Variations in adsorption capacity were provided by dilutions with quartz sand.

From all systems the uptake of calcium increased with increasing calcium levels. The calcium contents of peanut shells produced in the kaolinitic systems

were higher than those grown in the bentonite media. This difference was more pronounced at high percentages of calcium saturation and at the higher cation adsorption capacity levels (2.4 milliequivalents per 100 gm.). Uptake of calcium from the kaolinitic systems was more directly related to total calcium than to degree of saturation. In the montmorillonitic systems, absorption was more directly related to percentage calcium saturation. In the kaolinitic type of colloid, peanuts of good quality were obtained even at relatively low calcium levels. In the bentonitic system more calcium at high degrees of saturation was required for this.

Some relations between ferrous and ferric iron and high-line chlorosis, D. W. THORNE and A. WALLACE. (Utah Expt. Sta.). (*Utah Acad. Sci., Arts, and Letters, Proc.*, 21 (1943-44), p. 5).—The work here abstracted indicated that the ferrous is the more active form of iron in calcareous soils and in plants and that a deficiency of it is closely related to chlorosis. Soils deficient in available iron contained less iron that can be readily reduced to the ferrous form than did soils producing green plants. Chlorotic leaf tissues contained less soluble ferrous iron and had less capacity to reduce ferric iron to the ferrous form than did green leaf tissues. As a result of this study it is suggested that the oxidation-reduction potential of soils and plant tissues deserves more attention in relation to high-lime chlorosis than has been previously given it.

Possible role of boron in tobacco fertilization, T. R. SWANBACK. (Conn. [New Haven] Expt. Sta.). (*Soil Sci.*, 62 (1946), No. 2, pp. 137-149).—The author made a study of growth, quality, and some of the chemical constituents of Havana Seed tobacco grown in the Connecticut Valley under various fertilizer treatments on selected fields, 1941 through 1944, the results leading to the following conclusions:

Brown root rot in tobacco may be due to "crop fatigue" caused by insufficient boron or improper balance of potassium, calcium, and boron in the soil. Tobacco can be grown successfully after corn provided the level of soil fertility of corn land is on a par with that of tobacco land in good production, including sufficient boron. Suitable quantities of borax applied to corn land and tobacco land improved crop values as much as 12 percent. Potassium-calcium ratios, based on crop analyses, are widened by applied borax, that is, potassium increases in the plant while calcium remains fairly constant. A sufficient quantity of boron added to limed land will maintain a proper potassium-calcium balance. Satisfactory yields are obtained when the calcium-boron ratio in the crop is about 900 to 1. For considerable improvement in an already satisfactory crop, the ratio must be narrowed to about 300 to 1. Because of the close interrelation of potassium-calcium-boron, a ratio expressed by the fraction $(K \times B / Ca)$ is suggested. This ratio widens as the crop values increase. On typical Connecticut Valley tobacco soil the plants can tolerate more than 4 p. p. m. of boron but less than 8 p. p. m., and it would be safer not to exceed the lower figure. The ration of replaceable calcium to boron in soils is reflected to some degree in the corresponding ratio of the crop. The common practice of fertilization of tobacco in the Connecticut Valley maintains the boron status in the soil, partly by small additions of boron in the fertilizers and partly through the reactions in soil constituents of the materials added. Recommendations as to a general use of borax on tobacco land must await further investigation.

Fluorine in soils, W. O. ROBINSON and G. EDGINGTON. (U. S. D. A.) (*Soil Sci.*, 61 (1946), No. 5, pp. 341-353).—The authors determined the fluorine contents of 137 samples taken at various depths from 29 profiles representing the continental United States from New Hampshire to Texas and from Washington to Florida and from the Oahu clay profile of Hawaii. The samples cover a

variety of textures and parent materials. The average value found for the fluorine content of the surface soils was 292 p. p. m., but one of the four layers in a Michigan loamy sand showed only a trace and a Tennessee soil containing phosphate rock was found to contain 7,070 p. p. m. of fluorine in the layer at from 25 to 40 in. depth. In general, the fluorine content increased with the depth of the soil. Fluorine was considerably concentrated in the colloidal matter. Much of the fluorine in soils highest in fluorine was in the form of apatite. In general, the main source of fluorine in the ordinary soil consisted of the micaceous clays and there was no correlation between the phosphorus and fluorine contents of soil where the fluorine present was not mainly in the form of apatite. Six samples of micaceous clays which probably occur in soil had fluorine contents ranging from 300 to 7,400 p. p. m., averaging 3,730 p. p. m. An Ordovician bentonite contained the maximum quantity of fluorine. Much of the fluorine added to the soil in the form of superphosphate was found to be retained by the heavier textured soils, while coarse sandy soils retained less. Added fluorine in the form of superphosphate did not appear to increase significantly the fluorine content of plants. The fluorine contents of 28 samples of vegetation grown on a soil of known fluorine content are given.

Occurrence of selenium in Pleistocene deposits and their derivatives in South Dakota. W. V. SEARIGHT, A. L. MOXON, R. J. HILMOE, and E. I. WHITEHEAD. (S. Dak. Expt. Sta.). (*Soil Sci.*, 61 (1946), No. 6, pp. 455-463, illus. 1).—The authors investigated Pleistocene deposits, soils, plants, and bedrock materials in relation to selenium content and the source of selenium. The area studied included all of 10 counties and parts of 6 other counties in northeastern South Dakota. Selenium determinations were made on 220 composited samples of 15 glacial and related deposits and on samples representing 22 ft. of bedrock.

None of the till samples were selenium-free. Local maxima reach 3.70, 4.92, 5.38, and 0.86 p. p. m. selenium for undifferentiated Kansan and Iowan, Arlington, DeSmet, and Mankato tills, respectively. On the average, the tills contained less than 1.5 p. p. m. selenium. Arlington loess and loesslike silts contained little selenium in upland and hilltop positions, but depressions contained noteworthy quantities. Soils formed on loess and loesslike silts, particularly at low topographic positions, appeared to be more seleniferous than parent materials. The average selenium content of the soils analyzed was nearly 91 percent greater than the average selenium content of the loesslike silts. Outwash and valley train deposits contained selenium in varying quantities up to 3.72 p. p. m. Several cattle on one farm showed pronounced symptoms of chronic selenium poisoning in the winter of 1944-45. Considerable yearly variation was found in the selenium content of *Astragalus racemosus* Pursh samples grown in the area. All samples containing over 1,000 p. p. m. selenium were found growing in poorly drained, low topographic positions; pond water and ground water at these locations contained appreciable amounts of selenium in solution. The probable sources of the selenium in the Pleistocene deposits and soils developed thereon are discussed.

Some results from applications of coal to Utah soils. J. P. and D. W. THORNE. (Utah Expt. Sta.). (*Utah Acad. Sci., Arts, and Letters, Proc.*, 21 (1943-44), pp. 79-86, illus. 1).—Some commercial interests and a few investigators have recently advocated the use of coal or related materials for fertilizer. On the other hand, farmers in one of the coal mining areas of Utah have claimed damage to crops from deposits of slaked coal left on cropland by irrigation water.

During a 12-week nitrification test, coal, roasted coal, and peat produced no nitrate nitrogen, while three commercial coal fertilizers and the standard low-grade fertilizer did produce some quantities of nitrate. The standard fertilizer

was, however, the only one of the above materials which increased the yield of corn plants. Neither the coal itself nor the commercial so-called growth hormone extracted from coal was found to be of any appreciable value as fertilizer. The effects of coal at a rate of 5 tons or more per acre were found to be essentially the same as the effect of like quantities of sand added. In some instances increased yields were obtained, but additions of sand also increased yields and this effect probably resulted from improved physical conditions in the pots. Slaked coal applied to the surface of soils to a depth of 2 in. was not injurious to the growth of tomatoes under greenhouse conditions, but mulches were found generally beneficial in the greenhouse. No evidence to indicate that soil treatment with coal has any practical value in improving plant growth was found.

Fertilizer use and crop yields: A list of references, J. M. McNEILL (*U. S. Dept. Agr., Libr. List 27 (1946), pp. 67*).—This bibliography lists publications from the United States and territories containing original experimental data on the effects of fertilizer use on crop yields. It covers the period 1925–45, with a few items published in 1946.

Inspection of commercial fertilizers and agricultural lime products for the season of 1945, P. H. SMITH ET AL. (*Massachusetts Sta. Control Ser. Bul. 126 (1945), pp. 28*).—In addition to the usual analytical data for fertilizer mixtures and substances supplying single elements, the approximate money value of the shortage in plant food content per ton is added to the tabulation of the small number of deficient brands. Discovery of a substantial adulteration of bone meal with phosphate rock and ammonium sulfate or urea or both is reported upon.

AGRICULTURAL BOTANY

Synthesis of a polysaccharide from sucrose by *Streptococcus* s. b. e., C. F. NIVEN, JR., Z. KIZIUTA, and J. C. WHITE. (Cornell Univ.). (*Jour. Bact., 51 (1946), No. 6, pp. 711–716*).—Of the 34 strains of *Streptococcus* s. b. e. recovered from cases of subacute bacterial endocarditis, 32 synthesized large quantities of a polysaccharide from sucrose in broth culture, but synthesized little or none when streaked on sucrose agar. This unique property may prove helpful in identifying this streptococcus, such cultures having been recovered from about a third of the cases studied. The polysaccharide has been tentatively identified as a dextran.

***Streptococcus* s. b. e.: A streptococcus associated with subacute bacterial endocarditis,** J. C. WHITE and C. F. NIVEN, JR. (Cornell Univ.). (*Jour. Bact., 51 (1946), No. 6, pp. 717–722*).—The authors describe a hitherto unrecognized group of streptococci associated with subacute bacterial endocarditis; the streptococcus is of the viridans type, having a unique combination of physiological characteristics, including the ability to synthesize large amounts of a polysaccharide in a sucrose broth, to hydrolyze arginine, and to ferment inulin but not raffinose. The species name *S. sanguis* seems appropriate.

***Streptococcus* s. b. e.—Immunological characteristics,** M. R. WASHBURN, J. C. WHITE, and C. F. NIVEN, JR. (Cornell Univ.). (*Jour. Bact., 51 (1946), No. 6, pp. 723–729*).—The 42 cultures of *Streptococcus* s. b. e. recovered from subacute bacterial endocarditis fell into two serological types as determined by the precipitin technic. Five cultures gave positive precipitin tests with both type I and type II antisera. A serum prepared against one of these strains reacted with all 42 cultures; this appears to be due to the presence of antigens of both types in the cells of these strains. There appears to be a number of agglutinating antigens in the individual strains; the agglutination test, however, is not suitable for identifying this organism.

A study of streptococci associated with subacute bacterial endocarditis, C. F. NIVEN, JR., and J. C. WHITE. (Cornell Univ.). (*Jour. Bact.*, 51 (1946), No. 6, p. 790).—A collection of 113 cultures of streptococci isolated from 100 cases of subacute bacterial endocarditis was studied in an attempt to classify them according to their physiological and serological characteristics; the results are tabulated.

The influence of changes in concentration of sodium hydroxide upon its bactericidal activity, F. W. TILLEY. (U. S. D. A.) (*Jour. Bact.*, 51 (1946), No. 6, pp. 779–785, illus. 3).—The bactericidal efficiency of sodium hydroxide against *Staphylococcus aureus* and *Escherichia coli* was determined by a modified Rideal-Walker technic. From the resulting experimental data, values for the concentration exponent n were calculated by the formula previously described, viz, $n = \log t_2 - \log t_1 / \log C_1 - \log C_2$ for results presented in tabular form and by the formula $n = y_2 - y_1 / x_2 - x_1$ for those presented in graphical form. When test cultures were grown in ordinary beef infusion broth, the values obtained for n were approximately 1.6 for *S. aureus* and 5.6 for *E. coli*. Within a comparatively limited range of concentrations the bactericidal action of sodium hydroxide against both test organisms followed, with either small or large amounts of organic matter, an approximately logarithmic course. However, the slope of the curve was related to the organic matter present. Bactericidal efficiency was correlated with the final pH of the test mixtures. When the pH fell below 10, efficiency suddenly dropped and at a pH between 10 and 9 disappeared altogether.

Metabolism and the chemical nature of *Streptomyces griseus*, S. A. WAKSMAN, A. SCHATZ, and H. C. REILLY. (N. J. Expt. Stas.). (*Jour. Bact.*, 51 (1946), No. 6, pp. 753–759).—Growth of *S. griseus* was found to reach a maximum in stationary cultures in 10 days and in submerged cultures in 3 to 5 days, followed by lysis of the mycelium; it was accompanied by a gradual rise in the pH value of the culture and in the NH_3 and amino-N contents. The total N in the mycelium tended to be higher during active growth stages. Production and accumulation of streptomycin paralleled the growth of the organism. After maximum activity was reached, there was a drop in activity—rapid in submerged cultures. For streptomycin production, the presence in the medium of an organic substance is required. This substance may be designated as an “activity factor,” either serving as the precursor of the streptomycin molecule as a whole or of an important group in the molecule, or functioning as a prosthetic group in the mechanism essential for its synthesis. Such a factor can be gradually synthesized by the organism; when it is provided in the medium in a preformed state, however, as in meat extract or in corn steep, the process of streptomycin synthesis is greatly facilitated. *S. griseus* produces another antibiotic which is present in limited amount in the culture filtrate but more abundantly in the mycelium; it is distinct from streptomycin, being soluble in organic solvents and inactive against gram-negative bacteria.

The production of penicillin X in submerged culture, K. B. RAPEE and D. I. FENNEL. (U. S. D. A.) (*Jour. Bact.*, 51 (1946), No. 6, pp. 761–777, illus. 4).—Of several good penicillin-producing strains investigated, *Penicillium chrysogenum* NRRL 1984.A—a substrain derived from Minn. R-13—proved the best producer of chloroform-insoluble penicillin (penicillin X) when grown in submerged culture. By ultraviolet irradiation, a substrain designated NRRL 1984.N22 was developed; it produced substantially higher yields of penicillin X. The superior performance of the new substrain as a producer of penicillin X was repeatedly observed in shaken-flask cultures and was subsequently demonstrated in 600-l. vat fermentations. From one of these fermentations pure penicillin X

was isolated in a quantity verifying the approximate correctness of the survey data based on differential assays only. The technic of irradiation, the method of performing chloroform extractions, and the theory and practice of the differential assay used in demonstrating the presence and determining the amount of penicillin X are presented.

A comparison of penicillin-producing strains of *Penicillium notatum-chrysogenum*, F. B. GAILEY, J. J. STEFANIAK, B. H. OLSON, and M. J. JOHNSON. (Wis. Expt. Sta. et al.). (*Jour. Bact.*, 52 (1946), No. 1, pp. 129-140, illus. 1).—The penicillin-producing properties and gross metabolic characteristics of a number of strains of the *P. notatum-chrysogenum* group were compared in 100-gallon-tank fermentations. Aside from adequate aeration, the conditions apparently necessary for optimum penicillin production are rapid initial production of mycelium, the presence of a slowly fermentable carbohydrate and available N (e. g., NH_3) and maintenance of pH values at 7.0 to 7.8. The yield under these conditions varied widely with the culture used. Of the many strains tested, the mutant *P. chrysogenum* strains X-1612 and Q176 produced the highest yields; strain X-1612 yielded 400 to 500 units per cubic centimeter, and strain Q176 gave 700 to 900 units per cubic centimeter.

The effect of environmental conditions on penicillin fermentations with *Penicillium chrysogenum* X-16-12, J. J. STEFANIAK, F. B. GAILEY, F. G. JAEVIS, and M. J. JOHNSON. (Wis. Expt. Sta. et al.). (*Jour. Bact.*, 52 (1946), No. 1, pp. 119-127, illus. 5).—Penicillin yields were not appreciably affected by incubation temperatures of 20° to 29° C., but at 32° yields were definitely lower; metabolic processes were more rapid at higher temperatures. Fermentations were usually conducted at a tank pressure of 20 lb. per square inch; reducing this to 2 lb. failed to affect the fermentation, but at a tank pressure of 40 lb. per square inch the penicillin yields were reduced. Increased CO_2 tension did not affect penicillin fermentations. The metabolic changes in fermentations where glucose was the carbohydrate source were compared with those on standard lactose medium. Toxicity tests of antifoam agents in shake-flask experiments were performed. Of the agents proving nontoxic, 3 percent octadecanol dissolved in lard oil was found to be the best agent for controlling foam in tanks.

***Najas arguta* in Central America and its relationship to *N. wrightiana*, R. T. CLAUSEN.** (Cornell Univ.). (*Bul. Torrey Bot. Club*, 73 (1946), No. 4 pp. 363-365, illus. 1).—A taxonomic study of these members of the pondweed family, with two new subspecies of *N. wrightiana*.

The perennial species of *Urtica* in the United States east of the Rocky Mountains, F. J. HERMANN. (U. S. D. A.) (*Amer. Midland Nat.*, 35 (1946), No. 3, pp. 773-778).—In connection with the growing economic interest in the nettle as a source of chlorophyll, a review of the United States species of the genus was undertaken as a preliminary step in making field trials of such kinds as might be brought under cultivation in the eastern part of the country. Studies of the perennial nettles of eastern North America in the herbarium and under cultivation suggest that there is but one species, *U. dioica*; the typical form of this plant may have been introduced from Europe, although the evidence in hand fails to warrant a conclusion one way or the other. The nomenclatorial status of variants of *U. dioica* are discussed.

The edaphic factor in narrow endemism.—I, The nature of environmental influences, H. L. MASON. (Univ. Calif.) (*Madroño*, 8 (1946), No. 7, pp. 209-226).—The dynamics of the geographic distribution of any species involves the interactions between the environment, the physiological processes of the individuals of a population, and the genetic processes that fix tolerances and maintain or elaborate the population and preadapt individuals to environal fluctuations.

Endemic species do not differ significantly from so-called "ordinary" species in their dynamics; restriction in geographic range as applied to endemic species is thus of the same order—insofar as cause and effect are concerned—as the restriction of any and all other species. The area occupied by any species is determined by factors whose various conditions occupy an area independently of the fact that species might be restricted by them. Since only environal conditions independently occupy an area, it is the environment that determines the pattern of distribution of all plant species by permitting the functioning of only those individuals whose tolerances have been preadapted to the special conditions of the environment. Of the various categories of environal factors, the condition of any factor or combination of factors may serve to restrict the range of some plant species. Of these factors, however, the edaphic factor is most apt to occur in sharply defined patterns and often in small areas. In this connection, the regular occurrence—the world over—of highly restricted species in association with certain minerals and metals in the soil solution suggests that these substances play an important role in problems of the geographic distribution of highly restricted species. There are 16 references.

Variation in seed as shown by symbiosis, J. K. WILSON ([*New York*] *Cornell Sta. Mem.* 272 (1946), pp. 21, illus. 5).—The author studied variations in seeds from individual plants of four species (red and alsike clovers, black locust, and *Sesbania exaltata*). The comparative variation in each collection was ascertained by exposing plantlets to certain isolates of legume bacteria, the criterion being the nodulated condition of 30-day-old seedlings. The seeds were etched with concentrated H_2SO_4 , washed in water, bathed in a filtered solution of calcium hypochlorite, and planted, with the chlorine adhering to them, in previously sterilized flasks containing soil. Seedlings of each collection were exposed to the diverse isolates by dropping a suspension of the culture on the surface of the soil in the flasks. Controls were provided.

The results indicated that plantlets grown from seeds of an individual plant of the species employed may symbiose with a certain isolate, whereas plantlets grown from seeds of another plant of the same species may bear no nodules after exposure to the same isolate. This may be taken as evidence that seeds from cross-pollinating individual plants possess unlike generic characters as related to nodulation. Such variations are not embraced in the Linnæan concept of a species. The data also indicate that isolates representing several of the proposed cross-inoculation groups are not specific for those groups, since they effected nodules on plantlets of certain species assigned to other cross-inoculation groups. There are 15 references.

The use of enzymes in the preparation of root-tip smears, H. H. McKAY and A. E. CLARKE. (U. S. D. A.). (*Stain Technol.*, 21 (1946), No. 3, pp. 111–114, illus. 1).—A simple root-tip smear method for studying somatic chromosomes of *Allium* is described by which an aqueous solution of colchicine and Pectinol (a proprietary enzyme preparation) is used. The root tips are held in a 0.2 percent aqueous colchicine solution for 30 min., fixed in propionic-alcohol solution, run through a graded series of alcohols, washed thoroughly, treated with a 1 percent aqueous solution of Pectinol for 1 to 1.5 hr., and allowed to stand in water for 3 to 5 days to soften. A thin transverse section through the meristematic portion of the root tip is then smeared on a slide in a drop of propionocarmine stain in the usual way and sealed. The schedule presented has been tested with *Allium* only, but presumably may be adapted for use with root tips and similar tissues of plants other than those of the onion genus.

The influence of the composition of the medium on growth in vitro of excised tobacco and sunflower tissue cultures, A. C. HILDEBRANDT, A. J. RIKE,

and B. M. DUGGAR. (Wis. Expt. Sta. et al.). (*Amer. Jour. Bot.*, 33 (1946), No. 7, pp. 591-597, illus. 3).—The effects on growth of over 8,000 tissue cultures each of tobacco and sunflower in the first passage were studied in 108 media with increasing and decreasing concentrations of the constituents of the basal medium, plus ferric tartrate, pyridoxine, and nicotinic acid. In addition the combined good qualities of new media were studied with 2,000 and 4,500 cultures, respectively, of sunflower and tobacco tissue. Results indicated that the concentrations of many of the constituents of the basal medium should be increased. Ferric tartrate proved a better source of Fe than ferric sulfate. The omission of sucrose, Fe, and sodium dihydrogen phosphate resulted in poor growth of tobacco tissue cultures in the first passage. There was also less growth when KNO_3 , $\text{Ca}(\text{NO}_3)_2$, and KI were omitted. The omission of sucrose and sodium dihydrogen phosphate resulted in poor growth of sunflower tissue cultures in the first passage. When ferric tartrate, $\text{Ca}(\text{NO}_3)_2$, KI, and boric acid were omitted, less growth appeared than on control cultures. Pyridoxine was apparently favorable to growth of sunflower tissue. Formulas of the improved media for tobacco and sunflower tissue cultures are presented.

Nitrogen metabolism of corn (*Zea mays*) as influenced by ammonium nutrition, F. G. VIETS, JR., A. L. MOXON, and E. I. WHITEHEAD. (S. Dak. Expt. Sta.). (*Plant Physiol.*, 21 (1946), No. 3, pp. 271-289, illus. 4).—Corn plants previously depleted in soluble N compounds and showing N-deficiency symptoms on the lower leaves rapidly absorbed N from a complete nutrient solution containing $(\text{NH}_4)_2\text{SO}_4$ and continued to increase in weight. In time studies in which the $(\text{NH}_4)_2\text{SO}_4$ concentration was gradually increased to produce toxicity symptoms, injury failed to appear until the soluble N constituents of the sap had reached relatively high levels; the most notable toxicity symptoms were severe water deficit and necrotic areas on the leaves and leaf tips. Analysis of the expressed sap revealed that large amounts of glutamine, asparagine, α -amino, and other forms of soluble organic N had accumulated in the roots and tops; NH_4 did not increase rapidly until the soluble N had reached high values. There was a slight increase in pH of the sap in both roots and tops, but little change in total sugar or "true protein" as determined on dry material. Sap analysis on plants in a similar experiment indicated that part of the increase in soluble N was due to peptides and compounds that formed humin on acid hydrolysis of the deproteinized sap. Only a very small portion of the α -amino N synthesized consisted of basic amino acids. Undetermined soluble N and alkaloid N remained constant during NH_4 nutrition. Comparative rates of accumulation of N compounds in the roots and tops suggest that absorbed NH_4 is metabolized to asparagine, glutamine, and α -amino N mainly in the roots and subsequently translocated to the shoots. On an N basis, asparagine accumulates twice as rapidly as glutamine; one or more amino acids—other than glutamic and aspartic associated with the amides—may be quantitatively as important as asparagine in the metabolism of NH_4 by corn. The accumulation of α -amino N in the apparent absence of net protein hydrolysis is discussed. The true protein level is discussed in relation to water, amino acid, and sugar contents and to current theories of protein regulation. There are 49 references.

Some effects of altitude and water supply on the composition of *Derris elliptica*, R. H. MOORE. (P. R. Fed. Expt. Sta.) (*Bot. Gaz.*, 107 (1946), No. 4, pp. 467-474, illus. 2).—When *D. elliptica* was grown in Puerto Rico at elevations of 50 to 2,400 ft. above sea level and in Guatemala at 910 to 4,888 ft., the temperature factor correlated positively with the rotenone and inversely with the reserve carbohydrates in the roots. At elevations favorable to growth, the

accumulation of rotenone was influenced by major variations in water supply, but reserve carbohydrates were altered by relatively minor variations in available moisture. The varietal selection of derris grown in Guatemala appeared to be more adapted to higher variations (ecological sense) than the Sarawak Creeping variety grown in Puerto Rico. The normal effect of age on the percentage of rotenone was apparently obscure at high altitudes. Soil pH (4.7 to about neutral) had no measurable effect on either rotenone or carbohydrate reserves. At favorable altitudes, derris plants flourished in soils of good physical structure and belonging to several different types.

The effect of top environment and flowering upon top-root ratios, R. H. ROBERTS and B. E. STRUCKMEYER. (Wis. Expt. Sta.). (*Plant Physiol.*, 21 (1946), No. 3, pp. 332-344, illus. 8).—When 29 species or varieties of plants were grown in long and short photoperiods at minimum (night) temperatures of 55°, 65°, and 75° F. in a uniform soil, different species were found to have characteristic top-root relations. The top-root ratio varied with changes in physiological conditions associated with the seasonal development of the plant. A given external environment such as length of photoperiod or temperature was found not to have a similar effect on the top-root ratio of different species. Many of the species studied grew more roots in relation to the top in cooler than in warmer temperatures; some, however, had fewer roots in relation to top under the cooler temperatures. Likewise, some kinds had smaller top-root ratios in short and others in long photoperiods. The top-root ratio was uniformly larger when the plants came to flower; that is, blossoming plants consistently had fewer roots in relation to the amount of top at a given temperature than nonflowering plants of a given species. It thus appears that the composition and reserve conditions within the top are obviously large—if not the controlling—factors in the production of roots and consequently of the top-root ratio. There are 14 references.

Photoperiodic response as a factor in choice of plants for testing soil deficiencies, H. A. BORTHWICK. (U. S. D. A.) (*Soil Sci.*, 62 (1946), No. 1, pp. 99-107, illus. 2).—Although photoperiod may result in very marked differences in the development of many plants, methods are available for largely avoiding or preventing this source of seasonal variability. The purpose of this paper is to discuss such methods and to describe the photoperiodic responses of a number of kinds of plants that have been used or perhaps could be used advantageously for testing soil deficiencies. Considerable attention has been given to the fact that the growth and development of photoperiodically sensitive plants can be regulated to a considerable degree by comparatively simple methods of controlling day length. Photoperiod is much more simply and accurately attainable than the control of many other environal factors in greenhouse experimentation; it can be done automatically in many cases via an electric time switch activating a series of lights. Considerable variation in light intensity is without effect so long as the minimum intensity is above a predetermined threshold value; time of application and duration of the supplemental light are the critical factors. Selection of a test plant should be based on consideration of all the factors influencing its adaptability to a particular test. If the plant selected is not photoperiodically sensitive, this factor needs no further attention; if it is sensitive, its response probably can be regulated by artificial control of the photoperiod. Many workers have demonstrated that plants accumulate materials from the soil at varying rates throughout the season. These rates are probably more closely correlated with the type of development through which the plant is passing at a particular time than with the actual age of the plant. Considerable interest is therefore placed on the advantages resulting from use

of test plants whose development can be rather sensitively regulated by photoperiodic control. If facilities for such control can be provided, these plants are more to be sought after than avoided for test purposes because of the additional information and more dependable results that can be obtained with suitable experimental procedures.

The relation of photoperiod to the boron requirement of plants, R. MACVICAR and B. E. STRUCKMEYER. (Wis. Expt. Sta.). (*Bot. Gaz.*, 107 (1946), No. 4, pp. 454-461, illus. 8).—The intensity of boron-deficiency symptoms in soybeans proved much more severe in long than in short days. The reduction of symptoms in short days was due to a diminished B requirement rather than to changes in its absorption. The B content of plants exhibiting severe symptoms of deprivation (long photoperiod) and those showing no gross evidence of deficiency (short photoperiod) was essentially the same; histological examination of the stems confirmed this observation. There was little cellular disorganization in minus-B plants produced under short photoperiods; the deficient plants under long photoperiods, however, exhibited abnormalities, there being a marked increase in vascular tissue resulting from abnormal cambial activity and conspicuous necrotic areas in the phloem region.

Non-latex rubber in *Cryptostegia*, J. T. CURTIS, R. E. DUNCAN, and R. BLONDEAU. (Univ. Wis.) (*Amer. Jour. Bot.*, 33 (1946), No. 6, p. 578).—A recent paper by Whittenberger and Kerner (E. S. R., 94, p. 606) on rubber in *Cryptostegia* described the occurrence of globules of a hydrocarbon with the properties of low polymer rubber in the leaf chlorenchyma cells. This contribution presents observations on the occurrence of similar globules in other parts of this plant. The facts that such globules are found in nonchlorophyll-bearing cells, occur in greatest number in old cells, and are absent or rare in young actively photosynthesizing cells would appear to indicate that the reactions involved are not directly correlated with the carbon assimilation mechanism. It is believed that further investigation will be necessary before any definite statement can be made concerning the *in vivo* synthesis of rubber.

Contribution to the morphology and anatomy of *cryptostegia* (*Cryptostegia grandiflora*), E. ARTSCHWAGER (*U. S. Dept. Agr., Tech. Bul.* 915 (1946), pp. 40, illus. 25).—This contribution presents the results of a detailed study of the anatomy of *cryptostegia* with special reference to tissue ontogeny. The outer primary phloem consists of two distinct rings; the protophloem contains only a few narrow sieve tubes with the bulk of the tissue maturing into groups of fibers. The second ring of primary phloem is composed of discrete groups similar in composition to the inner phloem but smaller in size. The secondary phloem exhibits a very regular design; most conspicuous are the sieve tubes, starch-storing parenchyma cells, and crystal-bearing cells. The latex system is initiated in the embryo, each initial developing into a branching system ramifying throughout the entire plant. Branches pass freely from the pith into the cortex; they are observed frequently in tangential sections occupying the center of a ray. As the stem increases in diameter the latex cells also expand, since the cells of the cambium region remain meristematic. The latex cells of the secondary phloem of older stems are widely spaced, but, since the ring of secondary phloem is ever expanding, the area occupied by latex cells is not necessarily small. The phelloderm cells of both stem and root subdivide into a network of very small cells, each with a small crystal of calcium oxalate.

The anatomy of the abnormal swellings on the stems of some varieties of soybeans, B. E. STRUCKMEYER. (Wis. Expt. Sta.) (*Amer. Jour. Bot.*, 33 (1946), No. 6, pp. 571-577, illus. 19).—The Illini variety of soybean responded to photoperiod as an indeterminate type, blossoming in both long and short days.

The anatomical structure of the fourth internode of normal plants induced to flower was similar to that described for other soybean varieties and other species of plants. In short days with cool night temperatures, swellings of the third and fourth internodes occurred; these bore no relationship to blossoming, since plants in the long days that are normal also have fruits. The diameter of the swollen internode was about three times that of the normal stem; this increase in diameter was due largely to an increase in number and enlargement of the parenchyma cells. Groups of sieve tubes and companion cells formed by the cambium were frequently separated by vascular rays, the cells of which were enlarged and often radially stretched. The cambial region was relatively wide but did not consist of the tabular-shaped cambial cells as seen in transverse section. The cambium adjacent to the phloem appeared to be active, forming secondary phloem tissue. Plants of this nature were also found in the field and are referred to as "duds." Investigations of the swollen internodes showed anatomical conditions to be much like those described for abnormal plants grown in the greenhouse. In addition, there were distinct breaks in the vascular region of these stems, leaving spaces into which parenchyma cells were later differentiated. On comparisons of the structure of these abnormal internodes with stems of different species treated with growth substances by others, it appeared that stems treated with these substances show much proliferation of cells and meristematic activity, whereas in the stems here studied, the increase in diameter was to a large extent the result of an increase in size of the parenchyma cells and to some extent of an increase in cell number.

An oxidation and adsorption reaction for differentiating the endodermis and the collenchyma, D. S. VAN FLEET. (Univ. Mo.) (*Stain Technol.*, 21 (1946), No. 3, pp. 95-98, illus. 4).—The method described was found useful in histologically isolating these tissues, particularly where the accepted anatomical features and the usual staining reactions are not definitive. The exclusive oxidation of the leuco (reduced) form of common redox indicators to the colored (oxidized) form by the endodermis may be induced by treating free-hand or freezing-microtome sections with various alkaline salts at pH 8.5 to 9. Placing sections in sodium borate or sodium selenite induces an immediate oxidation of a tincture of gum guaiac in the endodermis and, after several minutes, a gradual and weak oxidation in the collenchyma. Addition of glycerol to sections exhibiting oxidation in the endodermis induces a localized adsorption of the oxidized indicator in the collenchyma. The endodermis and the collenchyma may be differentiated best by oxidation and adsorption, respectively, via sodium selenite, guaiac, and glycerol in the order given. The collenchyma in roots has not yet been defined; the reactions described introduce a new method for studying this tissue. By treating sections with boric acid a gradient in the guaiac reaction appears in the cortex.

Seed development in *Acalypha rhomboides* and some other Euphorbiaceae, M. LANDES. (Univ. Wis.) (*Amer. Jour. Bot.*, 33 (1946), No. 6, pp. 562-568, illus. 3).

Types of pods of *Asclepias syriaca* found in Michigan, F. K. SPARROW. (Mich. Expt. Sta. coop. U. S. D. A.). (*Jour. Agr. Res. [U. S.]*, 73 (1946), No. 3, pp. 65-80, illus. 5).—In recent years there has been a growing interest in the seed floss of various species of milkweed—accentuated by the outbreak of war which cut off the primary source of kapok—the East Indies. Descriptions and illustrations are given of 49 distinct types of pods of *A. syriaca* collected from 12 counties in the Lower Peninsula of Michigan; these by no means exhaust the number of types to be found in this region. The presence of so many different types within a very limited area suggests that they represent genetic entities rather than environal variations.

GENETICS

Evaluation of some clones of *Derris elliptica*, M. A. JONES, D. G. WHITE, and C. PAGAN. (P. R. Fed. Expt. Sta.). (*Trop. Agr. [Trinidad]*, 23 (1946), No. 5, pp. 89-93, illus. 1).—In this study of the criteria for derris clones the main consideration at present—with some limitations—should be the yield of rotenone per plant or per acre; secondary desiderata, the quality and yield of root. The possibility of ranking clones of a variety was explored with the result that—by use of the proper experimental design—it became possible to show differences, some of them highly significant, among them. In the selection work on this material several stages were realized: The original choices were made by the Chinese gardeners in Changi. The second segregations were made at the Goodyear plantation in Sumatra, where again the low-grade selections were discarded. At this station nine clones of the best selections were evaluated twice. The first ranking, made at the time the plants were 2 yr. old, was found to agree fairly well with that made in a complete harvest after the plants had been in the field 4 yr. Further confirmation of the ranking obtained remains to be done, especially under conditions in which large-scale production is anticipated. It was shown that the large roots contained the major portion of the rotenone present in the root system. The inverse relationship between root quality and yield is discussed.

Artificial and natural hybrids in the Gramineae, tribe Hordeae.—II, Agropyron, Elymus, and Hordeum, G. L. STEBBINS, JR., and J. I. and R. M. VALENCIA. (Univ. Calif.). (*Amer. Jour. Bot.*, 33 (1946), No. 7, pp. 579-586, illus. 17).—A continuation of this series (*E. S. R.*, 95, p. 648).

Comparative rates of pollen tube establishment in diploid and tetraploid maize, J. M. GREEN. (Iowa Expt. Sta. coop. U. S. D. A.) (*Jour. Hered.*, 37 (1946), No. 4, pp. 117-121, illus. 1).—Monoploid (n) pollen was found to become established faster than $2n$ pollen on both diploid and tetraploid silks, but the time required for establishment of either pollen was not affected significantly by the kind of silk it was germinated on. Indications were that n and $2n$ pollen absorb water at a similar rate during the first minute of immersion in water and sucrose solutions of low concentrations. The pollen known to become established more rapidly, n and Wx , had higher osmotic pressure than $2n$ and wx , respectively.

A second factor for subcoat in sorghum seed, J. C. STEPHENS. (U. S. D. A. and Tex. Expt. Sta.) (*Jour. Amer. Soc. Agron.*, 38 (1946), No. 4, pp. 340-342).—Presence or absence of subcoat, the layer of thick brown cells originating from inner integument and located immediately outside the aleurone of sorghum (*Sorghum vulgare*) seed, is determined by complementary genes. The first factor pair was called Bb (*E. S. R.*, 51, p. 29), and it is suggested the second pair be designated B_2b_2 . The B_2b_2 genes appeared to be inherited independently of those for awns (Aa), male-sterile-2 (M_2m_2), plant color (Pp), dry foliage color (Rr), green-striped (Gg), midrib (Dd), and waxy endosperm (Wwx).

Mutation in certain phytopathogenic bacteria induced by acenaphthene, P. A. ARK. (Univ. Calif.) (*Jour. Bact.*, 51 (1946), No. 6, pp. 699-701).—Acenaphthene-saturated broth proved capable of inducing permanent mutations in *Phytomonas michiganensis* and *Erwinia carotovora*. Some mutants of *E. carotovora* possessed a reduced pathogenicity for carrot roots, and one mutant of *P. michiganensis* was nonpathogenic. Acenaphthene did not act alike on all species of bacteria.

A method of evaluating production inheritance, E. G. MISNER. ([New York] Cornell Sta., *A. E.* 554 (1946), pp. 54, illus. 18).—To facilitate the analyses

of production records in the pedigree of an animal, the author has devised a special form in which the ancestors are given codes which consist of a number and an alphabetical symbol. All males are given Roman numerals commencing with I for the sire, II for the sire's sire, and then proceeding with numbers from top to bottom of the old-style pedigree. All females are given Arabic numerals beginning with 1 for the dam and continuing with 2 for the sire's dam and so on from top to bottom. The sires and dams of female ancestors have odd numbers while the sires and dams of male ancestors have even numbers. The code number of the sire and of the dam of each male ancestor in the pedigree is twice the number of the male, and that of the dam for each female ancestor in the pedigree is twice the number of the female plus 1. All ancestors on the sire's side of the pedigree are given S as the first letter and all on the dam's side the letter D as the first letter of an alphabetical symbol to accompany the number. All males have the letter S and all females the letter D as the last letter of the symbol. For the parents of an animal, therefore, the alphabetical symbol is the same as that of the animal plus S if the sire or plus D if the dam of the animal. The methods of analyzing production records in a pedigree are explained, with numerous illustrations. A production inheritance index is set up, and the factors governing the selection of a herd sire are discussed.

Chance as a cause of changes in gene frequency within pure breeds of livestock, J. L. LUSH. (Iowa Expt. Sta.). (*Amer. Nat.*, 80 (1946), No. 792, pp. 318-342).—Following a discussion of the influence of migration, mutation, and selection on the pure breeds of livestock, the author considers how chance can affect gene frequency, taking up variations in the number of offspring per parent, emphasis on one ancestor in selections, functional stratification of purebred herds, nonrandom mating, and the actual amount of random change in gene frequency.

It is concluded that chance deviations in gene frequency from one generation to the next, as a result of Mendelian sampling and the elimination of potential parents, are important in the pure breeds of livestock. Standard deviations of the order of 0.02 to 0.05 for gene frequencies near 0.5 seem to be about the usual magnitude of these chance changes in one generation. The major cause for these changes being so much larger than would be required automatically by the finite size of the population seems to be inequality in the number of gametes which the various potential parents actually contribute to the next generation. "Attention to family and pedigree, plus the economic incidents which happen to whole herds, probably emphasize this more in livestock than is usual in most species in nature, although this statement about purebred livestock as compared with wild species is an expression of faith which might be severely shaken if we knew more about the actual pedigrees of wild organisms."

The use of improved sires, C. C. HAYDEN (*Ohio Sta. Spec. Cir.* 73 (1946), pp. 67, illus. 30).—This is a brief history of the 13 Jersey and 10 Holstein-Friesian sires used in the station herds over a period of about 40 yrs. as based on records of breeding and production in these herds since about 1904. An attempt was made to eliminate interfering factors such as disease, experiments with restricted rations, and others. The results are deemed about what dairymen may expect from the use of sires selected as calves, even when they are backed by good records.

"The daughters of only the first 3 Jersey and the first 4 Holstein sires averaged below 300 lb. of fat as heifers milked twice daily. A heifer which exceeds 300 lb. of fat under these conditions is not a bad heifer."

A recurrent mutation of dominant achondroplasia in cattle, S. W. MEAD, P. W. GREGORY, and W. M. REGAN. (Univ. Calif.) (*Jour. Hered.*, 37 (1946),

No. 6, pp. 183-188, illus. 2).—A dominant mutation that reduces skeletal development was studied in a herd of cattle in Sonoma County, Calif. Heterozygous animals may be recognized by lack of height, occasioned largely by short legs. In the homozygous state there is marked achondroplasia, which is lethal. The mutation occurred spontaneously in one bull whose parents were normal in size.

Developments in artificial insemination of dairy cattle, J. A. HENDERSON. (Univ. Ill.) (*Cornell Vet.*, 36 (1946), No. 2, pp. 118-137).—This is a discussion of the development of organized insemination since 1939.

Comparison between intracervical and intrauterine methods of artificial insemination, A. F. HOLT (*Vet. Rec.*, 58 (1946), No. 29, pp. 309, 310).—An analysis of records with two bulls at a commercial artificial insemination center in South Devon showed 56.1 percent of conceptions in 374 first inseminations by the intrauterine method as compared with 33.4 percent in 377 inseminations by the intracervical method.

A synthetic pabulum for the preservation of bull semen, P. H. PHILLIPS and R. R. SEITZER. (Wis. Expt. Sta.) (*Jour. Dairy Sci.*, 29 (1946), No. 7, pp. 407-414).—Observations pertinent to the storage of bovine semen are reported, on the basis of which a synthetic pabulum for bull sperm storage is suggested. "Its essential ingredients should include freshly purified lipids, specific sugars—glucose and galactose—a buffer system, a gum to supply the proper physical consistency, and an agent to control bacterial contamination."

Factors affecting productivity in breeding sheep, L. M. WINTERS, D. L. DAILEY, O. M. KISER, P. S. JORDAN, R. E. HODGSON, and W. W. GREEN. (*Minnesota Sta. Tech. Bul.* 174 (1946), pp. 28).—The records of performance of 603 ewes are analyzed in regard to methods of appraisal and as to the influence of various factors on productivity.

"It was found that the less precise methods of appraisal yielded essentially the same information as the more refined methods regarding which ewes should be retained in the flock. The production per 100 lb. of ewe is, therefore, recommended as the most generally useful method of calculating data.

"The factors having greatest influence on productivity are twins, survival, market grade of lambs, fleece weight, and lamb weight for age. The factors rank in importance in about the order given. This is a point, however, on which it is impossible to be definite, because the weights of the various factors will differ from flock to flock. Fleece weight and lamb weight for age appear to be of more importance in comparisons between breeds than within breeds. Weight of ewe, often considered of major importance, was found in this study to be a minor factor and perhaps of no importance excepting as it may affect the type of lamb produced."

The data presented indicate that breed differences extend beyond the more superficial characters such as face markings, type of ear, etc., and into the factors of major importance affecting productivity. The effects of crossbreeding on productivity were most favorable when rams of the larger breeds were used.

A method of gathering performance data on sheep is proposed. It is further suggested that the objective in sheep breeding for the Middle West should be the development of a ewe that will produce an average wool clip of 9 lb. per 100 lb. of ewe and that will lamb and raise twin lambs that weigh 90 lb. when 20 weeks old and possess sufficient quality to "top" the market.

Environmental temperature and thyroid gland involvement in lowered fertility of rams, R. BOGART and D. T. MAYER. (*Missouri Sta. Res. Bul.* 402 (1946), pp. 43, illus. 18).—Continuing the investigations on "summer sterility" in rams initiated by McKenzie et al. in 1937 (*E. S. R.*, 78, p. 181), seven techniques for the evaluation of semen were employed in a comparison of semen specimens from

rams before and after exposure to prolonged periods of high summer temperatures. Semen so exposed differed from that of normal rams in its possession of a decreased volume, a lowered rate of spermatozoan motility, a markedly decreased number of spermatozoa, a larger number of morphologically abnormal and dead spermatozoa, and of a lesser number of resistant or physiologically normal cells.

It is concluded that "high summer temperatures are a major factor in the production of a temporary sterility (summer sterility) in rams. Less extreme variations in the reproductive activity of rams reflected by fluctuations in certain semen characteristics are apparently associated with environmental temperature changes even during the period of summer sterility.

"Thyroxine or thyroid-active protein, administered orally or by injection, alleviates those symptoms of summer sterility resulting from impaired spermatogenic activity, but neither substance has any effect upon those symptoms of summer sterility correlated with a decline of the activity of the interstitial tissues. Administered thyroid-active substances eliminate those fluctuations in semen characteristics which are associated with slight variations in environmental temperature.

"Changes in reproductive activity and in semen characteristics similar to those typical of summer sterility are induced during the fall breeding season by the administration of thiouracil through feeding or by injection. Thyroxine or thyroid-active protein in adequate quantities counteracts the detrimental effects of thiouracil upon reproductive activity.

"It is concluded that the thyroid gland is of major importance in the reproductive physiology of the ram. Further, it may be concluded that changes in environmental temperatures produce variations in reproductive activity in the ram indirectly through the thyroid gland."

Effects of some environmental factors on weanling traits of range Columbia, Corriedale, and Targhee lambs, L. N. HAZEL and C. E. TERRILL. (U. S. D. A.) (*Jour. Anim. Sci.*, 5 (1946), No. 3, pp. 318-325).—The effects of sex, age of dam, type of birth, age at weaning, and percentage of inbreeding were studied on 478 Columbia, 238 Corriedale, and 366 Targhee lambs raised in 1941 and 1942 at the U. S. Sheep Experiment Station. Differences in weaning weight between ram lambs and ewe lambs, lambs from mature and 2-year-old dams, and single and twin lambs were 10.8, 8.7, and 11.7 lb., respectively. Ewe lambs, lambs from mature dams, and single lambs had longer staple and were given higher type and condition scores than the contrasting groups. Face covering and neck folds were not strongly influenced by any of the factors. Merit in each of the traits increased with age at weaning, as indicated by regression coefficients. Inbreeding had a noticeably detrimental effect upon weaning weight, body type, and condition, but not upon length of staple.

Induction of mating and lambing in anestrus ewes following pregnant mare serum administration, G. W. VAN DER NOOT, R. P. REECE, and W. C. SKELLEY. (N. J. Expt. Stas.). (*Jour. Anim. Sci.*, 5 (1946), No. 3, pp. 313-317).—When 177 anestrus ewes received either one or two injections of pregnant mare serum (250-350 rat units), 136 came into estrus and mated, 22 following a single injection and 114 following a second injection usually made 16 days after the first. Of the 70 ewes which lambled, 5 had received one and 65 two injections.

Fertility and hatchability of the prematurely ovulated hen's egg, B. H. NEHER and B. M. FRAPS. (U. S. D. A.) (*Jour. Expt. Zool.*, 101 (1946), No. 1, pp. 83-89).—Continuing earlier studies (E. S. R., 89, p. 48), the results demonstrated that the first egg of a hen's clutch can be fertilized and reach advanced embryonic development when forced, by the intravenous injection of male chicken anterior pituitary hormone, to ovulate 30 hr. prematurely. Of 13 eggs from hens

ovulating 22 hr. prematurely, 9 were fertilized and 6 hatched. At prematurities of 6 and 14 hr., there was practically no difference in fertility and hatchability between 38 prematurely ovulated eggs and 102 normally ovulated control eggs. When ovulation was forced by prematurities of 22 and 30 hr., many of the resultant eggs were laid prematurely despite the excision of the ruptured follicles both of the forced ovulation and of last normally occurring ovulation. This observation is in contrast with the usual retention of normally ovulated eggs for a day or more beyond time of expected lay following removal of the associated ruptured follicle.

Insulin-induced rumplessness of chickens, II, III. ([Conn.] Storrs Expt. Sta. et al.). (*Jour. Expt. Zool.*, 101 (1946), No. 1, pp. 41-50; 102 (1946), No. 1, pp. 1-22, illus. 4).

II. Experiments with inactivated and reactivated insulin, W. Landauer and E. H. Lang.—This series (E. S. R., 93, p. 705) was continued to secure information on the chemical nature of the rumplessness-inducing properties of insulin by injecting inactivated and reactivated insulin preparations into White Leghorn eggs. It was found that complete inactivation of insulin with iodine is associated with loss of those of its properties which interfere with normal rump development. Reversible inactivation of insulin with methyl alcohol and hydrochloric acid was about 95 percent complete. Injection of this reversibly inactivated insulin resulted in an incidence of rumplessness which was slightly, but significantly, higher than that expected from an active insulin solution of corresponding potency. Reactivation of the reversibly inactivated insulin with sodium hydroxide led to complete recovery of the insulin activity in the fraction isolated. Reactivation reestablished completely the rumplessness-inducing properties of insulin; in fact, the injection of such reactivated insulin solutions was followed by a slight, but significant, excess in the incidence of rumplessness as compared with the effect of an active insulin solution with identical potency. It is concluded that the effect of insulin on rump development is mediated by the molecule as a whole.

III. The relationship of dosage and of developmental stage at time of injection to response, W. Landauer and C. I. Bliss.—In this part the relation of dosage to incidence of rumplessness was tested over a range of 0.05 to 5.0 units per egg on White Leghorn stock and between 1 and 5 units per egg on creeper stock. The insulin was injected into the eggs before the start of incubation. When percentage rumplessness was transformed to probits and the dose of insulin to logarithms, the observations in both series could be fitted by straight lines, incidence of rumplessness increasing with dosage of insulin. The dosage-response curve for creeper eggs was parallel to, but considerably lower than that for Leghorn eggs, indicating that the response of creeper embryos is considerably less than that of Leghorn embryos over the range of tested doses of insulin.

Experiments in which a standard amount of insulin (2 units) was injected at different times after the beginning of incubation showed that the incidence of rumplessness rose slowly to a maximum at about 31 hr. of incubation, after which it tended to drop. The rumplessness-inducing effect of insulin approached zero at about 72 hr. of incubation. These conclusions apply to both Leghorn and creeper embryos. The response of creepers was lower than that of Leghorns at all developmental stages.

As measured by embryonic mortality during the first 6 days of development insulin was less toxic to creeper than to White Leghorn embryos. This was true whether the insulin was injected prior to incubation or at various stages during the first 3 days of development.

In White Leghorn stock selected for a high and low response to insulin, respectively, it was found that insulin injection after 2 or 4 hr. of incubation

resulted in a significantly higher incidence of rumplessness in embryos of the high response line. The lower response line, however, exhibited higher early embryo mortality.

The production of twins in *Gallus domesticus*, P. D. STURKIE. (Ala. Polytech. Inst.). (*Jour. Expt. Zool.*, 101 (1946), No. 1, pp. 51-63, *illus.* 3).—Continuing a study by Sturkie and Williams (E. S. R., 94, p. 327), this article deals with the effects of changes in body temperature of the hen upon subsequent development of the embryo, with particular references to the production of duplications and abnormalities. Hypothermia was induced in hens from the time of laying up to 7 hr. after laying of the previous egg, or before and during ovulation of subsequent ova, and during the early cleavage stages. The sub-normal body temperature was maintained from 1 to 4½ hr. and ranged, in most cases, from 36.7° to 38.3° C. When the cold treatments were terminated, the birds were warmed, and most of them had regained normal body temperature within 1 hr. after the end of the treatments. The eggs were taken from the hens the day following the treatment, 24½ to 25½ hr. from the time of laying of the previous eggs. Some of them were set as soon as laid and others were held at room temperature for 24 hr. before incubating. After incubating at 37.5° for 44 to 72 hr., the eggs were opened and the embryos examined.

Among a total of 73 embryos studied, there were observed 6 cases of duplication, or an incidence of 8.2 percent. Five of these duplicities resulted from a treatment in which case the hypothermia was induced and terminated in most hens before the onset of the first cleavage division. Twenty-four of the embryos studied showed abnormalities other than doubling, and 43 were normal morphologically but retarded in development.

FIELD CROPS

Designs and technic for the adaptation of controlled competition to forage plant breeding, W. KELLER. (U. S. D. A. coop. Utah Expt. Sta.) (*Jour. Amer. Soc. Agron.*, 38 (1946), No. 7, pp. 580-588, *illus.* 4).—Arrangements of plants, suggested as a means of introducing both intra- and inter-specific competition into the breeding nursery, consist of placing single plants of from two to five species in such a way that each plant is adjacent to at least one plant of its own species and at least one plant of each of the other (one to four) species. By one type of arrangement each plant has four direct competitors and by another type six. Guides, described, greatly simplify the mechanics of planting. The method provides a means of working simultaneously with all of the species (up to five) of both grasses and legumes desired in the pasture mixture.

Straw strength of small grains, H. H. LOVE. ([N. Y.] Cornell Expt. Sta.) (*Farm Res. [New York State and Cornell Stas.]*, 12 (1946), No. 3, p. 9, *illus.* 2).—A simple apparatus for testing strength of straw enables the selection of varieties of small grain resistant to lodging. Comparisons are made of the merits of the resistant Wong barley and Poland (which lodges badly) and of Cornell 595 v. Michikof wheat. In general, varieties having the highest weight of 100 straws required the greatest weight to break them.

Effects of lime, fertilizer, and preceding legumes on the yields of corn and tobacco: Experiments on Sango silt loam at Mericourt Station, Clarks-ville, C. A. MOORE and O. H. LONG (*Tennessee Sta. Bul.* 200 (1946), pp. 12, *illus.* 4).—Yields are reported for corn, tobacco, soybeans, wheat, alfalfa, Korean and sericea lespedeza, and red clover and grasses grown for 10 yr. in 5 crop rotations on a very poor soil (deficient in lime and usual fertilizer elements) limed and treated with superphosphate and potassium chloride and sulfate. Average increases in yield in response to lime and K, respectively, were for

clover-and-grass hay 117, 123 percent, Korean hay 94, 16; sericea hay 38, 17; soybean hay 35, 40; wheat 37, 0; and corn 29, 6 percent. No alfalfa was obtained without lime, and it made 54 percent response to K. Tobacco showed no average gains for lime, but received good indirect effects from liming of alfalfa and sericea. Its response to K was 36 percent. In the first cycle of the rotation, consistent relationship was slight between preceding legumes and the comparative ranking of the following corn and tobacco. In the second 5 yr. corn did best after alfalfa, clover-and-grass, and sericea, and tobacco after alfalfa, sericea, and clover-and-grass in order. Sericea was deemed much superior to Korean lespechea as a crop for soil improvement.

[Farm crops research in Mississippi] (*Miss. Farm Res. [Mississippi Sta.], 9 (1946), No. 4, pp. 1, 2, 5, 8*).—Progress results from agronomic investigations are reported in articles entitled: Alyce Clover in Tests by Substations, by H. W. Bennett (pp. 1, 2); Time of Transplanting Important for Sweetpotatoes, by W. S. Anderson (pp. 1, 5); and Deep Placement of Fertilizers Used as a Side Dressing, by W. B. Andrews (p. 8).

Pollination, *Lygus* infestation, genotype, and size of plants as affecting seed setting and seed production in alfalfa, J. W. CARLSON. (U. S. D. A. and Utah. Expt. Sta.). (*Jour. Amer. Soc. Agron., 38 (1946), No. 6, pp. 502-514, illus. 2*).—Genotypes and individual plants of alfalfa were shown to vary widely in seed setting. The structure of the alfalfa flower favors tripping and cross-pollination by wild bees and honeybees, although relatively efficient seed setting is obtained for some plants with self-pollination associated with conditions favoring automatic tripping. Potential seed production capacity of genotypes and individual plants seems to be associated closely with response to artificial cross-pollination. Response to self-pollination with artificial tripping seems to have predictive value. High yields and maximum production of seed appear to depend also upon an adequate size and large physical capacity of the plants for seed production. Importance of size, however, may be limited to conditions favoring efficient pollination and seed setting. *Lygus* infestation, if uncontrolled, may reduce profitable production of seed about as effectively as does artificial exclusion of pollinating insects. Significant negative correlation was shown between percentage of flowers tripping and *Lygus* populations of plots receiving different insecticidal treatments.

Influence of tripping, soil moisture, plant spacing, and lodging on alfalfa seed production, H. M. TYSDAL. (U. S. D. A. and Nebr. Expt. Sta.). (*Jour. Amer. Soc. Agron., 38 (1946), No. 6, pp. 515-535, illus. 2*).—In seed-production studies with alfalfa, 1938-40, an average of less than 5 percent of the flowers set seed without tripping. Rain, sun, and wind might cause some tripping, and a limited amount of self-tripping and setting seed occurs without it. However, such tripping and seed setting is relatively unimportant for seed production compared to the tripping and crosspollination caused chiefly by beneficial insects, including wild bees, honeybees, and a few other insects which are insufficient in practically all fields at the present time.

Plants grown in the greenhouse in 3-gal. jars with high soil moisture content produced more seed than those grown at medium or low soil moisture. Plants growing in soil relatively low in moisture content in the field produced more seed than those in high moisture, when spaced 8 in. each way. Spaced 32 in., however, low and high soil moisture plots made about the same amount of seed, indicating that high soil moisture content, as such, is not an inhibiting factor. Lodging plants at time of bloom by bending and fastening down the stems greatly reduced seed production as compared to upright plants. Lodged plants produced much more new growth, as shown by many more stems per plant, and produced 20 percent shriveled seed compared to 5 percent for upright plants.

Alfalfa in Kansas, C. O. GRANDFIELD and R. I. THROCKMORTON. (Coop. U. S. D. A.). (*Kansas Sta. Bul.* 328 (1945), pp. 64, illus. 28).—Recent information provided on alfalfa production in Kansas is based on prolonged research at the station and elsewhere, and extensively noted. Topical discussion is accorded alfalfa investigations; production, including soil preparation, seed and seeding, and cultivation; varieties, covering the commonly grown and new varieties, variety tests, and group classification; time of cutting for hay, seed, silage, and other products; harvesting for hay and for seed; alfalfa for pasture and grass mixtures; and the control of diseases, insects, and rodents attacking alfalfa.

Bahia grass types, G. W. BURTON. (U. S. D. A. coop. Ga. Coastal Plain and Ga. Expt. Stas.). (*Jour. Amer. Soc. Agron.*, 38 (1946), No. 3, pp. 273-281, illus. 3).—Bahia grass, *Paspalum notatum*, is not a native of the United States. Strains discovered in the United States to date might be grouped into six types, Common, Wallace, Paraguay, Wilmington, Pensacola, and Tampa, which types differ greatly in leaf size and shape, rate of spread, earliness, seed and forage production, floret size and shape, fertility, frost resistance, winter survival, sod density, and palatability. Twenty somatic chromosomes were found in root tips of Pensacola Bahia; all other Bahia types studied had 40 as the $2n$ number. Common Bahia has been intentionally introduced by man from many different parts of the tropical portion of the Western Hemisphere, whereas limited distribution of the other types around southeastern seaports suggests their introduction by chance in ballast and packing of early seaborne cargos. Texas strains seemed identical with an introduction from Paraguay, Pensacola Bahia resembled an Argentina introduction very closely, and Tampa Bahia appeared very similar to numerous herbarium specimens from the West Indies.

The course of the pollen tube in cultivated barley, M. N. POPE. (U. S. D. A.). (*Jour. Amer. Soc. Agron.*, 38 (1946), No. 5, pp. 432-440, illus. 17).—Germination of the pollen grain occurs on the stigma hair, and the tube enters the central lumen through the angle between the papilla and the base of the cell just above. The tube, pointed downward, traverses the hair down into the style. Enlargements of the tube may occur while it pushes its way between the cells of the style and those of the ovary wall. The tube resumes its normal diameter as soon as a path through an obstruction has been made. As it enters the ovary, the pollen tube passes along the S-shaped band of conducting tissue to the cone-shaped projection of the outer integument on the upper end of the ovule, thence between the inner epidermis of the ovary wall and the outer integument, over the abchalazal surface of the ovule, through the micropyle. It then pierces the wall of the nucellus and discharges the male nuclei into the embryo sac. The barley ovary is described.

Growing winter barley in New Jersey, R. S. SNELL, C. S. GARRISON, and G. H. AHLGREN (*New Jersey Stas. Bul.* 727 (1946), pp. 28, illus. 15).—Popular information is given on the status of winter barley in New Jersey, value for feed, cultural and harvest practices, and control of insects, and reports are made on results of variety and planting tests. Production must exceed average State yields of 30 bu. per acre if winter barley is to be profitable as a cash crop where the grain is sold for feed. If used for feed and straw on the farm where produced, barley is of much greater value than if marketed for cash. Wong barley, found the most productive of grain and straw of any variety tested, excels in resistance to mildew and lodging, has erect spikes, and is comparatively easy to combine. It needs more fertilizer than other varieties for maximum performance. Maryland Smooth Awn, the earliest maturing barley tried, probably surpasses Wong as a companion crop in seeding down to hay or pasture. Ken-

tucky 1, the winter-hardest in tests, may be of most value in northern New Jersey counties where winter-killing remains a problem.

October 1 appeared in station tests to be the latest date for satisfactory plantings. A seeding rate of 2 bu. per acre was indicated as most favorable with September plantings. Higher rates than 2 bu. have partly compensated for later planting. Damage from hessian fly might be minimized by seeding from September 10 to 20 in central New Jersey and from September 20 to 30 in southern New Jersey.

Use of the natural crossing plot in making castor bean hybrids, R. O. WEIBEL and C. M. WOODWORTH. (Ill. Expt. Sta.). (*Jour. Amer. Soc. Agron.*, 38 (1946), No. 6, pp. 563-565, illus. 1).—The facts that the castor-bean is wind-pollinated and the pistillate and stamen flowers are borne separately on the spike, the former above the latter, permit the use of crossing plots in making hybrids. Staminate flowers are easily removed before pollen is shed. The male and female parents planted in alternate rows in plots of 10 to 14 rows 2 rods long, isolated by spotting in cornfields, produced relatively large amounts of crossed seed and pure seed of the male parent.

Early testing of inbred lines of corn, G. F. SERAGUE. (Iowa Expt. Sta. and U. S. D. A.). (*Jour. Amer. Soc. Agron.*, 38 (1946), No. 2, pp. 108-117, illus. 2).—When 167 S_0 plants from a stiff-stalked synthetic corn were self-pollinated and top crossed on Iowa Hybrid 13, highly significant differences were obtained among yields of these top crosses. S_1 plants of two samples selected from the population of selfed plants on the basis of top-cross yield, the upper 10 percentile, and a seriated sampling of the frequency distribution, were self-pollinated and outcrossed to the tester. In the 10-percentile sample top cross, yields were equal to the mean of the selected parents. In the seriated sampling, correlation between S_0 and S_1 top-crossed yields was +0.85. Three S_2 lines tested in single crosses averaged better in performance than the five standard commercial lines with which they were compared.

Tests of corn hybrids and varieties in Mississippi, 1945, R. C. ECKHARDT, W. A. DOUGLAS, and A. L. HAMNER. (Coop. U. S. D. A.). (*Mississippi Sta. Bul.* 427 (1946), pp. 10).—Outstanding corns in results of State-wide tests included Mississippi experimental hybrid 5111; La. 468, 1030, and 502; N. C. 5001 and 4003; and Funk G714 hybrids, and the open-pollinated Station Mosby, Station Laguna, and Jellicorse varieties. Yields and other agronomic data are tabulated by locality and also in summary tables.

Distribution of corn plants in the field, G. H. DUNGAN. (Ill. Expt. Sta.). (*Jour. Amer. Soc. Agron.*, 38 (1946), No. 4, pp. 318-324, illus. 2).—Grain yields from corn in single-plant hills, 1930-33, 1940-42, were significantly superior on productive soil in seasons with a well-distributed and ample rainfall than from the same population in multiple-plant hills. Single-plant hills had greatest advantage at relatively high plant population rates. Diameter of stalks at their base and stover yield were higher in every test for the single-plant distribution. Single-plant hill plots lodged more and had higher tiller numbers than multiple-plant hill plots. Increases in grain yields for single-plant hills were attained through increases in size of individual ears and in number of ears per stalk.

Environmental modification of fiber properties as a source of error in cotton experiments, D. M. SIMPSON and K. L. HERTEL. (U. S. D. A. coop. Tenn. Expt. Sta.). (*Jour. Agr. Res. [U. S.]*, 73 (1946), No. 3, pp. 97-111).—Samples of seed cotton were obtained from six varieties at six locations in the Cotton Belt in 1941 and 1942. Pickings were made at regular intervals at each place, so that samples represented production during definite growth periods. Length and uniformity in length were determined by the fibrograph, fineness by the arealo-

meter, and strength of fiber by the Pressley strength tester. Factors involving change of environment, such as location, date of opening, or year of growth, caused wide variation in the physical properties of the fiber of the several varieties. Among the upland varieties, variation within variety due to environment often exceeded the differences between varieties due to hereditary influence. In breeding for fiber quality, unless extreme care be taken in field sampling, environmental factors may introduce bias enough to mask heritable qualities and vitiate conclusions drawn from accurately measured samples.

Potash and lime requirements of cotton grown in rotation with peanuts, J. J. SKINNER, W. L. NELSON, and E. R. COLLINS. (U. S. D. A. and N. C. Expt. Sta.) (*Jour. Amer. Soc. Agron.*, 38 (1946), No. 2, pp. 142-151, illus. 2).—Yields of cotton in studies 1938-43 were significantly increased on Norfolk very fine sandy loam, Ruston loamy sand, and Craven and Lenoir fine sandy loams by the use of 48 lb. of K_2O per acre in a complete fertilizer as compared to 24 lb. Wickham sandy loam, which gave no significant response, contained 0.19 m. e. of exchangeable K. The other soils contained 0.07-0.10 m. e. The 48 lb. of K_2O applied directly to cotton gave higher cotton yields on all soils than 25 lb. or 50 lb. of K_2O to peanuts in addition to 24 lb. to cotton. Peanut yields were not affected significantly by these K_2O treatments. Neutral fertilizers increased cotton yields on Lenoir fine sandy loam which had a pH of 5.0, 0.24 m. e. of exchangeable Mg, and a saturation of 23 percent with Ca. Dolomitic limestone applied in the row to peanuts also increased cotton yields on this soil.

The beginnings of crested wheatgrass in North America, A. C. DILLMAN. (U. S. D. A.). (*Jour. Amer. Soc. Agron.*, 38 (1946), No. 3, pp. 237-250, illus. 5).—Crested wheatgrass was grown under cultivation in Russia as early as 1897, and the first plant selections of record were made by Russian workers previous to 1906. The first lots of seed brought in by N. E. Hansen in 1898 were distributed to individuals, but did not become established in the United States. The second importations in 1906, listing the two types *Agropyron cristatum* and *A. desertorum*, were distributed widely between 1907 and 1913. The author maintained both types in tests at the Belle Fourche Experiment Farm (Newell, S. Dak.), 1908-20, and supplied seed for planting at the Northern Great Plains Field Station (Mandan, N. Dak.) and at Ardmore, S. Dak. The first planting made in 1915 at Mandan was foundation stock from which seed was first released to farmers in the northern Great Plains. Plant selections made in 1919 at the Belle Fourche Station were grown at Mandan. Some 4,000 lb. of seed, representing four of the better selections, have been produced and distributed to growers. The former view that the two types of crested wheatgrass, *A. cristatum* (S. P. I. No. 19536) with 14 ($2n$) chromosomes, and "standard" *A. desertorum*, with 28 ($2n$) chromosomes, are distinct species appears to have been justified. The Fairway variety and S. P. I. No. 19536 appear to be similar or identical strains of *A. cristatum*.

Response of rotenone-bearing devil's shoestring, *Tephrosia virginiana* (L.) Pers., to fertilizer applications, G. A. RUSSELL and V. A. LITTLE. (U. S. D. A. coop. Tex. Expt. Sta.). (*Jour. Amer. Soc. Agron.*, 38 (1946), No. 7, pp. 646-650).—N, P, and K fertilizers were applied to field plots of devil's shoestrings alone and in combination for periods of 1, 2, and 3 yr. N increased the yield of roots significantly, while K increased root yield and improved their quality as measured by percentage of rotenone and total chloroform extractives. P had no effect on yields of roots but reduced their quality significantly.

The growth and rubber content of guayule as affected by variations in soil moisture stresses, A. S. HUNTER and O. J. KELLEY, (U. S. D. A.). (*Jour.*

Amer. Soc. Agron., 38 (1946), No. 2, pp. 118-134, illus. 7).—Irrigation experiments with guayule in its second year of growth in the field were made on Delano sandy loam and Sorrento silty clay loam soils in the San Joaquin Valley, Calif., involving five differential moisture treatments ranging from very high to very low maintained through the growing season. Increases in shrub weight ranged from 1,000 lb. per acre on low-moisture plots to more than 10,000 lb. on those of higher moisture level. Increases in amount of rubber ranged from 190 to 650 lb. per acre on the sandy loam and from 350 to 515 lb. on the silty clay loam. The highest moisture levels on the sandy loam produced the highest yields of shrub and rubber, while on the silty clay loam the highest rubber yield was produced by the lowest moisture level, explainable on the basis of the differences in the moisture retention curves for the two soil types. An inverse relationship existed between dry weight of shrub and percentage of rubber. Fertilizers increased weight of shrub but decreased percentage and absolute amount of rubber. Moisture treatment had slight effect upon the percentage of resin. No noticeable symptoms of guayule diseases resulted from any moisture treatment.

Increased rubber production from thickly seeded guayule, O. J. KELLEY, H. R. HAISE, L. C. MARKHAM, and A. S. HUNTER. (U. S. D. A.). (*Jour. Amer. Soc. Agron.*, 38 (1946), No. 7, pp. 589-613).—Experiments in southern California indicated that for maximum rubber production by guayule, dense stands of plants are to be recommended, especially for short-cycle production. Optimum irrigation and fertility treatments appeared to be related closely to soil and climatic conditions.

The germination of guar, *Cyamopsis tetragonolobus* (L.) Taub., A. F. MUSIL. (U. S. D. A.). (*Jour. Amer. Soc. Agron.*, 38 (1946), No. 7, pp. 661-662).—A constant temperature of 30° C. appeared to be optimum for satisfactory germination of guar seed in the laboratory. The common late-maturing crop produces a variable proportion of nonviable seed, believed to be the result of frost. An early maturing strain with a high proportion of hard seeds germinated slowly and irregularly. Seed treated 15 min. with 75 percent sulfuric acid gave complete germination in 3 to 6 days. No seedling injury resulted when treatment was prolonged to 30 min. A good field stand may be obtained by pretreating well-matured seed with sulfuric acid and delaying planting until the ground is thoroughly warm.

Effects of fertilizers on yields and breaking strengths of American hemp, *Cannabis sativa*, H. V. JORDAN, A. L. LANG, and G. H. ENFIELD. (U. S. D. A. coop. Wis., Ill., and Ind. Expt. Stas). (*Jour. Amer. Soc. Agron.*, 38 (1946), No. 6, pp. 551-563, illus. 2).—Hemp made its major response in fertilizer tests to N. On the less productive soils, N increased yields markedly without detrimental effects to fiber quality. On good fertile soils, yield response was small, and both on the fertile soils and where N application exceeded the optimum the reductions occurred in fiber strength, ranging from 4.4 to 14.7 percent. Associated with this effect abundant N caused a more leafy and succulent type of growth and increased stem diameters above the optimum range. The problem in fertilizing hemp seems to be to adjust rates and balances of nutrients so as to insure maximum production and maintain fiber quality. On peat soil in 1943, heavy applications of minerals produced high yields of hemp but the fiber was weak. In 1944 the available N level was reduced by applications of carbonaceous material and minerals were applied. Yield was only moderate but the fiber had good quality.

The retting of hemp, I-III (*Iowa Sta. Res. Buls.* 342 (1946), pp. 830-891, illus. 29; 343, pp. 893-924, illus. 16; 344, pp. 825-944, illus. 1).—There are three contributions in this group. See also earlier notes (*E. S. R.*, 94, p. 191).

I. *Field retting of hemp in Iowa*, W. H. Fuller, A. G. Norman, and C. P. Wilsie.—Experiences are reviewed for two seasons of contrast in retting conditions, in that in 1943 much of the commercial crop was insufficiently retted while in 1944 over-retting was common. An analysis of factors involved in field retting as developed from detailed studies of experimental plots in both seasons is included. In the north-central area in Iowa, in which commercial hemp was grown in 1943 and 1944, successful field retting is at best very uncertain. Normal rainfall and moisture conditions in that area are adequate to permit retting to proceed to completion, but great divergences from the normal in both total rainfall and pattern of distribution makes the venture risky. Chances of obtaining a successful crop are good, whereas chances of retting that crop successfully are much poorer. Good hemp could undoubtedly be grown in western Iowa, yet the drier fall conditions that are normal for that area would make retting even more risky an operation than in the other parts of the State. Hemp should be harvested early in September, which should increase expectation of exposure to rain. If retting is proceeding only slowly because of dry weather, and is limited primarily to the top hemp as a result of dew deposition, turning should accomplish a greater measure of uniformity and should be done well before retting of the top hemp is completed, and probably when the dark flecked areas on the straw become numerous. Hemp cut early in September is usually ready to be turned by the middle or the latter part of the month. Turning after October 15 may not be worth while if retting is to be completed by October 31, so that the crop can be picked up early in November. Turning is not essential if retting proceeds fairly uniformly throughout the swath, which is likely to be the case in rainy and humid periods. In harvesting the hemp, every effort should be made to leave as short a stubble as possible, particularly if the harvest is delayed and if the stand is heavy. A short stubble means greater retention of moisture by hemp at the bottom of the swath and consequently a greater likelihood of uniform retting.

II. *Controlled retting of hemp*, W. H. Fuller and A. G. Norman.—Controlled methods of retting in general released a fiber superior in quality and uniformity to that ordinarily obtained by field retting. Retting in tanks under anaerobic conditions was faster than any of the aerobic methods, and produced a fiber with more desirable characteristics. Retting under anaerobic conditions was fastest at 37° C., the acidity of the solution held to a minimum, the solution undisturbed, and an enrichment culture added initially as inoculum in amount equal to 10 percent or more of the total tank solution. The main acids produced under anaerobic conditions were acetic (predominating) and butyric. Some nonvolatile acid was also produced in lesser amount. Acid accumulation and consequent retardation of the retting process was prevented by aeration, and later return of part of the retting solution in a separate tank.

Loss in weight of the hemp and production of volatile acids may be used to a limited extent as indicating rate and degree of retting on a laboratory scale, provided that uniform material of the same source and maturity is used. The end point of retting for hemp of mixed sources, as would be obtained commercially, could not be judged from volatile acid accumulation or loss of weight of straw. A small pilot plant with a capacity of 200 lb. of hemp straw was operated successfully. Anaerobic conditions were maintained in the tank, and acid accumulation was prevented by continuous withdrawal, aeration, and replacement of the tank solution, which was re-used repeatedly.

III. *Biochemical changes accompanying retting of hemp*, W. H. Fuller and A. G. Norman.—Bark from hemp retted in the field and under controlled conditions in the laboratory was analyzed at intervals to follow biochemical changes

occurring during retting. Pure cultures of certain dominant retting fungi were inoculated into sterile hemp bark, and similar analyses were carried out after decomposition was allowed to continue for intervals up to 20 days. Regardless of method of retting or stage of maturity of the hemp, there was considerable early loss of water-soluble constituents, of furfuraldehyde-yielding constituents, and total uronic groups.

Reduction in total uronic content of the bark reflected progress of retting better than that of any other constituent. Well-retted hemp bark had a total uronic content of about 5 to 6 percent as compared to 9 to 10 percent on unretted bark. Under controlled anaerobic conditions about one-half of the water-soluble constituents and the furfuraldehyde-yielding constituents were removed in the first 36 hr. Attack upon cellulose was negligible until after 48 hr. Under field conditions appreciable cellulose utilization was evident when the samples were well retted.

Progress of retting was invariably accompanied by an attack on polyuronide hemicelluloses proportionately as great, or almost so, as that upon pectin. Freeing of the bundles could not be regarded as exclusively a matter of pectin decomposition. No appreciable changes occurred in major constituents of the woody portion of hemp straw during retting. Various fungi in pure culture were quite similar in attacks effected upon constituents of hemp bark. There was no indication that *Trichothecium roseum*, which in the field was suspected to cause fiber weakness, was more vigorous in cellulose decomposition than other organisms normally present on hemp straw.

Ecological and morphological characteristics of black medic strains, R. E. BLASE and W. E. STOKES. (Fla. Expt. Sta.). (*Jour. Amer. Agron.* 38 (1946), No. 4, pp. 325-331, illus. 3).—Commercial strains of black medic (*Medicago lupulina*), except Alabama-grown seed, were low yielding, volunteered very unsatisfactorily, bloomed very late, and seeded sparsely when compared with Florida seed sources 1942-44. Plants from commercial seed sources, except Alabama seed, produced leafy, prostrate, rosette plants due to the short internodes. Plants from Florida seed sources (natural stands) had long internodes, a stemmy appearance, and an ascending habit of growth. The commercial strains produced dark green foliage, while the Florida strains were light green, and seed size also differed greatly. Productivity and morphological characteristics and seed of Florida strains also differed, but most of them were adapted to Florida environment.

The history and evolution of milo in the United States, R. E. KARPEN and J. R. QUINBY. (Tex. Expt. Sta.). (*Jour. Amer. Soc. Agron.*, 38, (1946), No. 5, pp. 441-453).—Milo, a group of varieties of *Sorghum vulgare*, was introduced into the United States as Yellow Milo Maize from an unknown source about 1885. Its commercial varieties have comprised 75 to 80 percent of the grass sorghum crop in Texas, and are almost as important in other southwestern States. Comment is made on the genetics of the milo group, varieties arising through mutation and recombination, and root rot-resistant varieties of milo.

Effect of soil characteristics and fertilization on potatoes as regards yield and tissue composition, J. M. MACGREGOR and C. O. ROST. (Minn. Expt. Sta.). (*Jour. Amer. Soc. Agron.*, 38 (1946), No. 7, pp. 636-645).—Potatoes grown on 12 fields in the Red River Valley (E. S. R. 94, p. 193) in soils ranging from clay loams to sandy loams were fertilized with 125 lb. of superphosphate alone and with 200 lb. of KCl per acre. The fertilizer gave economic increases in yield of tubers but produced no significant change in percentages of Ca, Mg, P, or K in the roots and stems of the plants. Applications of KCl increased Cl uptake with a repression of sulfate. Ca and Mg content rose with increasing concentrations

of soil carbonates with evidence of some phosphate repression. Soluble soil sulfates repressed Cl uptake with the assimilation of larger amounts of sulfate. Tuber yield increased as soil texture became finer with an appreciable increase in the K content of the tops.

The comparative evaluation of fourteen types of ramie under Cuban conditions, J. C. CRANE and J. B. ACUÑA. (U. S. D. A. et al.) (*Jour. Amer. Soc. Agron.*, 38 (1946), No. 2, pp. 152-167).—In a comparison of growth response and fiber production of *Boehmeria utilis*, *B. japonica*, and 12 types of *B. nivea*, three harvests during the year of planting gave total yields of stems and leaves ranging from 15,435 lb. per acre of Antigua de Botanica to 41,367 lb. per acre for de Francia. Type C produced a total of 565 lb. of dry degummed fiber per acre, followed in order by de Francia, 517 lb., and D, 505 lb. Americana was the most prolific stem producer, but had the shortest stems; its prolific habits might be combined with the greater vigor and fiber-producing capacity of types D, C, or de Francia. Average percentage of fiber of the green weight of defoliated stems ranged from 1.5 for type A to 2.8 for type D. Types C, de Francia, and D appeared to be the better adapted in regard to plant growth and yield of fiber in Cuba.

The effect of plant spacing and time of harvesting on fiber yield of ramie, *Boehmeria nivea* (L.) Gaud, J. C. CRANE and J. B. ACUÑA. (U. S. D. A. et al.) (*Jour. Amer. Soc. Agron.*, 38 (1946), No. 3, pp. 225-236).—Plants of type C ramie, the most productive of 14 types tested at the Cuban Agricultural Experiment Station, were set 12, 18, and 24 in. apart in rows 2, 3, and 4 ft. wide. Average production of all spacing treatments from the 90-day harvest was 580 lb. of degummed fiber per acre as compared to 435 lb. for the 60-day harvest, yet the results are deemed inconclusive, due to factors involved. Average production of fiber from all spacings of the 3-ft. width rows of the 60-day harvest was 6 and 24 percent greater than for the 2- and 4-ft. width rows, respectively, and for the 90-day harvest, 8 and 31 percent greater. Slightly larger yields from plants spaced 12 and 18 in. did not pay for the additional plants needed. The percentage of fiber of the green weight of stems did not increase with age of the stem as in some other bast fiber plants. For fiber quality, harvesting should be delayed until the ultimate height of the crop is reached for maximum production of fiber per unit area.

The effect of straw and nitrogen on the yield and quantity of nitrogen fixed by soybeans, L. A. PINCK, F. E. ALLISON, and V. L. GADDDY. (U. S. D. A.) (*Jour. Amer. Soc. Agron.*, 38 (1946), No. 5, pp. 421-431, illus. 2).—Yields of inoculated soybeans were decreased significantly by straw applied at time of planting or 6 weeks earlier, due in part to a moderate initial "hunger period." Under conditions favorable for rapid growth, urea increased yields but had little effect upon the total N content of the plants. Urea N was merely used instead of atmospheric N. Delayed planting, following application of straw-nitrogen mixtures, sometimes resulted in very slightly lower yields and N contents of soybeans. Urea depressed N fixation, whereas straw increased it, the maximum being N 165 lb. per acre. Where enough straw was added to inactivate any N present, there was no marked effect of either on N fixation. Carbonaceous crop residues evidently should be used in a legume cropping system, wherever feasible, rather than in a nonlegume commercial N system. Adequate commercial N may sometimes be desirable to decompose crop residues even when a legume is grown.

2,4-D as a means of controlling weeds on sugarcane lands, G. ABCE-NEAUX, L. P. HERBERT, and L. C. MAYEUX, Jr. (U. S. D. A.) (*Sugar Bul.*, 24 (1946), No. 9, pp. 65-68, 70).—On sugarcane plots sprayed with 2,4-D in 1945

for control of alligatorweed (E. S. R., 93, p. 283), cane yields averaged slightly higher than yields from plots hoed three times during the growing season and nearly 3 tons of cane and more than 700 lb. of sugar higher than from plots given flame cultivation. Plots of the 2,4-D series also showed the lowest residual weed infestation. Advantages of 2,4-D over other methods tested were especially conspicuous in an experiment on poorly drained Sharkey clay heavily infested with alligatorweed. Destruction of shoots and stunting of growth so harmed the weed that cane plants achieved complete dominance and effectively crowded it out. Neither hoeing nor flaming suppressed the weed enough to permit effective competition by sugarcane plants. Results from the treatments did not differ much on well-drained Yazoo very fine sandy loam with a much lower initial infestation of alligatorweed. Among other weeds commonly infesting growing cane, various species of morning-glory and birdseye (*Capronia castanefolia*) proved relatively sensitive. In experiments with alligatorweed on ditch banks, ditch bottoms, and fallow areas, 2,4-D applications at appropriate intervals resulted in progressive decimation of underground storage organs. Sprouts that grew after this treatment developed slowly and were readily crowded out by other plants.

A "new" cultivated sunflower from Mexico, C. B. HEISER, JR. (Univ. Calif.). (*Madroño*, 8 (1946), No. 7, pp. 226-229, illus. 1).—A brief report on a previously unknown cultivated form of sunflower, including comparisons with two other cultivated forms of *Helianthus annuus*. The exact relationship of the Mexican sunflowers to the cultivated forms of the Hopi and to the various types cultivated in Europe and North America can scarcely be discussed in the light of published evidence now available. It is considered highly desirable that additional information be obtained on the primitive sunflowers of Mexico.

Black root rot resistant strains of Havana seed tobacco for the Connecticut Valley, C. V. KICHTLINGER. (Partly coop. U. S. D. A. and Conn. [New Haven] Expt. Sta.). (*Massachusetts Sta. Bul.* 432 (1946), pp. 20, illus. 6).—Attempts to develop a strain of Havana Seed tobacco satisfactorily resistant to black root rot, yet capable of producing high yields of good quality, are reported with comments on the nature of the disease, its economic importance, and control.

Havana 211, derived from Page Comstock $\times$ Havana 38, was produced as a result of cooperative breeding work in the Connecticut Valley and in Wisconsin. Havana K2 was developed in Massachusetts from a cross of regular Havana Seed (Sandman strain) onto Havana 211. Havana 211 and Havana K2 equaled or exceeded Havana 142 slightly in gross yielding capacity under black root rot promoting conditions, and surpassed regular Havana Seed considerably under conditions favorable for tobacco. They may be acceptable in productiveness under most circumstances in the Connecticut Valley. Compared with regular Havana Seed, Havana 211 endures drought better, is not so readily attacked by flea beetles and thrips, and matures about 7 to 10 days later. Havana K2 and Havana 211 do not differ greatly in the more evident characteristics of type. It is largely improvements in certain characteristics of type, earlier maturity, better curing, and better sweating or fermenting that suggest the possibility that Havana K2 may be more satisfactory than Havana 211 for general growing in the Connecticut Valley. Havana 211 has been largely instrumental in increasing the cash income of many farmers who grow Havana Seed tobacco.

The Oklahoma farm wheat improvement program: Progress report, 1938-45, R. M. OSWALT. (*Oklahoma Sta. Misc. Pub.* 9 (1946), pp. 7+, illus. 2).—Established in 1937 to improve the quality of wheat grown in Oklahoma, the program (E. S. R., 87, p. 511) has for aims more acres of high quality seed planted; reduction of mixture of wheat with rye and other cereals and smuts; and elimination of varieties of poor bread-making characteristics. Considerable improvement has been made in the quality of Oklahoma wheat since 1937. Growers have

become much more variety conscious, and wheat and rye mixtures have decreased. Farm samples showed an increase in grade A from 1939 through 1943, slightly falling off in 1944 and 1945, probably due to a high demand for all wheat for foreign trade regardless of quality and to the lack of good seed for planting. Average (weighted) acre yields over various periods were for Tenmarq 18.8 bu., Turkey 16.1, Cheyenne 18.1, Blackhull 16.9, Chiefkan 18.6, Early Blackhull 19.2, Comanche 21.6, Pawnee 22.5, Red Chief 20.2, Reliant 21.9, Triumph 21.9, Kanred 13.5, Wichita 22.5, and the soft wheats Kawvale 15.2, Clarkan 16.1, Fulcaster 11.4, and Harvest Queen 13 bu. Comanche, Chiefkan, and Pawnee averaged slightly higher in percentage of protein than Tenmarq, while Turkey, Cheyenne, Blackhull, Triumph, Reliant, Red Chief, and Kanred were slightly lower. Early Blackhull averaged 9 percent lower than Tenmarq in 61 tests. The 4 varieties classed as soft red winter were from 5 to 11 percent below Tenmarq. Varieties found definitely desirable for bread making were Turkey, Tenmarq, Cheyenne, Comanche, and Pawnee, but other varieties also have proved satisfactory. Early Blackhull or Haerberle, Chiefkan, and Red Chief had undesirable bread-making qualities. All of 15 varieties compared 1941-44 except Kawvale were from 1 to 7 percent higher in test weight than Tenmarq. Kawvale was 2 percent below Tenmarq.

Seed wheat studies stress importance of quality, M. T. MUNN. (N. Y. State Expt. Sta.). (*Farm Res. [New York State and Cornell Stas.]*, 12 (1946), No. 3, p. 8).—Quackgrass, cockle, and hairy vetch were the most widespread impurities found in high quality seed wheat. Many stocks contained light, shriveled kernels due to *Fusarium* blight (scab), and stinking smut was common in all stocks. Chess and cockle were the commonest weeds in samples of wheat delivered to mill from a wide area. Eight of 20 truckloads were too foul with vetch for use as seed.

The effect of wheat variety upon maltose values, E. G. BAYFIELD. (Kans. Expt. Sta.). (*Jour. Amer. Soc. Agron.*, 38 (1946), No. 7, pp. 624-629).—Examination of wheat varieties grown at various Kansas locations 1941-43 indicated that hard flinty varieties, as Chiefkan, were consistently high in maltose value of flour, an important quality factor to the baker, whereas the soft wheat Clarkan gave much lower values. Tenmarq, Turkey, and Blackhull were about equal. Kawvale, officially graded as a soft wheat although not so considered by soft wheat millers, was in the Tenmarq-Turkey group. Maltose value seemed to be an inherited character, although its annual expression was largely modified by environmental factors.

Wheat viability loss due to fumigation and its relation to baking quality, R. T. COTTON, J. C. FRANKENFELD, E. G. BAYFIELD, and J. A. JOHNSON. (U. S. D. A. coop. Kans. Expt. Sta.). (*Northwest. Miller*, 227 (1946), No. 2, Sect. 2, pp. 4a-5a).—With excessive dosages or exposure periods, fumigants commonly used to treat wheat in storage may cause loss of viability, particularly if the grain moisture is above 12.5 percent. With ordinary dosages and exposures these fumigants affect temporarily the baking quality of flour made from the wheat, but the effects disappear if the grain is aerated enough. Loss of viability from many causes may impair baking quality, yet these studies indicated that partial or completed loss of viability due to fumigation does not necessarily impair baking quality even after storage of the wheat for 1 yr.

Period of effective weed control by the use of 2, 4-Dichlorophenoxyacetic acid, P. C. MARTH and J. W. MITCHELL. (U. S. D. A.). (*Science*, 104 (1946), No. 2691, pp. 77-79).—Results on lawn grass plots indicate that once established weeds have been killed by means of 2,4-D (E. S. R., 93, p. 285) sprays, and young seedling weeds subsequently germinating in surface soil layers have been eradicated by further spraying, it is feasible to maintain a weed-free lawn by

judicious use of 2,4-D. Repeated sprayings have not proved harmful to established grasses, and in the absence of weeds the sod had developed a uniformly dense coverage of the soil surface which in itself tends to discourage infestation by most common lawn weeds. Preliminary results with dry mixtures of fertilizer and 2,4-D were promising for weed control in lawns, pastures, and other grassy areas. This method makes it possible to apply effective weed-killing and fertilizing treatments in the same operation, saving time and labor.

Weed-free lawns for New York—new acid kills lawn weeds with single application should be used to supplement fertilizer, A. M. S. PRIDHAM. ([N. Y.] Cornell Expt. Sta.). (*Farm Res. [New York State and Cornell Stas.]*, 12 (1946), No. 3, p. 7, illus. 1).—Practices for lawn areas in New York, based on test results and experience, include application of fertilizer in fall and spring at the rate of 20 lb. of 5-10-5 to 1,000 sq. ft., cutting the grass to at least an inch in height, and leaving the clippings on the lawn. 2,4-D is applied in May or June to remove dandelion or plantain, kill young weed seedlings, and halt germination of any remaining weed or grass seed. When lawns are once weed free, fertilization is continued to thicken the turf and to crowd out weed seedlings. Colonies that may become established are spot sprayed or, to be certain, sprayed once a year in late May.

Ragweed pollen may be eliminated—one application of 2,4-D at proper time sufficient—must be used with care around crop plants, F. G. SMITH. (N. Y. State Expt. Sta.). (*Farm Res. [New York State and Cornell Stas.]*, 12 (1946), No. 3, pp. 1-2).—Development of ragweed pollen in both common and giant species has been successfully prevented in test areas by spraying with 2,4-D early in August. Tests showed that the spray must be applied before the pollen-bearing parts of the flower have opened and have begun to ripen, usually August 1-7 in the vicinity of Geneva. Water sprays containing 0.1 percent of 2,4-D and 0.5 percent of Carbowax were effective applied at rates of 100 to 200 gal. per acre. The 2,4-D could also be effectively applied as a fog, using an oil solution of the material in a fog applicator. This method has advantages of swifter application and lower cost and of requiring much smaller volumes of solvent. The spray should be used with caution near crop plants.

Laboratory studies on glycerin as a supplement in water-soluble herbicidal sprays, H. HOPP and P. J. LINDER. (U. S. D. A.). (*Amer. Jour. Bot.*, 33 (1946), No. 7, pp. 598-600, illus. 1).—The herbicidal effects of sodium arsenate, ammonium sulfamate, sodium trichlorophenoxyacetate, and sodium pentachlorophenoxyacetate were tested at high and low atmospheric humidity, *Coleus* and *Ouphea* being used as test plants. The results indicated that a higher water tension inside the plant from low humidity promoted the herbicidal effectiveness. At low humidity, however, the herbicides dried rapidly on the leaf surfaces, and absorption was decreased. Addition of glycerin to the solution increased the effectiveness of the herbicide at low humidity. Glycerin is believed to act by keeping the poisons in solution for absorption into the leaves over an extended time. This supplementary solvent reduced the amount of herbicide needed for killing over that required in a simple water solution.

HORTICULTURE

Sidedressing beets with salt gives marked returns, J. SHAFER, JR. and C. B. SAYRE. (N. Y. State Expt. Sta.). (*Farm Res. [New York State and Cornell Stas.]*, 12 (1946), No. 3, pp. 12, 13).—Following an earlier report (E. S. R., 92, p. 206) upon favorable results obtained with applications of common salt (sodium chloride) to canning beets, experiments were continued. In 1944 records were taken in three beet fields and substantial yields were obtained from salt appli-

cations. In one instance, 400 lb. of salt per acre broadcasted before planting increased the yield by 6 tons per acre. In 1945 data were obtained from 10 experimental fields, and in every case the use of 500 lb. of common salt per acre increased yields. This was true even when the yield without salt was 24 tons per acre. The salt may be applied either before planting or as a side dressing, but application is advised not later than 6 weeks after the beets are seeded if full benefits are expected. Increases were obtained even when nitrate of soda, a sodium salt, was used in the regular fertilizer.

Carrot production in the west and southwest, T. W. WHITAKER, J. H. MACGILLIVRAY, J. T. MIDDLETON, and W. H. LANGE (Coop. Calif. Expt. Sta.). (*U. S. Dept. Agr. Cir. 750 (1946), pp. 32, illus. 23*).—This circular presents a comprehensive picture of carrot production in the western States. Included are soil and climatic requirements, varieties, seed production, soil preparation, fertilizer needs and cultural operations, harvesting and preparation for market, and various plant disease and insect enemies and their control.

Sweet corn suckering trials in California, P. A. MINGES ET AL. (Calif. Sta., [n. d.], pp. 4, illus. 2).—Long-continued and widely scattered investigations conducted with irrigated sweet corn showed no significant improvement in yield, number of ears, or size of ears that could be attributed to the removal of secondary shoots. The process, commonly known as suckering, is deemed inadvisable, since it adds to cost of production with no compensating benefits.

Progress being made in development of downy mildew resistant cucumbers (*South Carolina Sta. Rpt. 1945, pp. 134-138, illus. 2*).—In 1939, two downy mildew resistant cucumbers, Puerto Rico 37 and Chinese Long, were crossed with a commercial variety A & C. After several generations, types were selected which combined resistance and good type. In 1943 additional crosses were made between Puerto Rico 40 and two new varieties, Cubit and Marketer.

In 1945 a serious outbreak of downy mildew occurred and destroyed the vines of all commercial varieties by June, whereas most of the resistant lines grew until plowed under in August.

The fruit type of some of the new resistant progenies approached that of Cubit and Marketer. The resistant lines produced fewer misshapen fruits in the latter part of the season than did commercial varieties, due possibly to the better retention of foliage. An increase in infection in resistant lines observed during a stormy period in September is attributed to injury and water soaking which may have been conducive to infection.

Nutrition of the cultivated mushroom, C. TRESCHOW (*Dansk Bot. Arkiv, 11 (1944), No. 6, pp. 180, illus. 24*).—A monographic presentation considering the history of the cultivated mushroom, systematics, technics of cultivation, influences of temperature and pH on growth, mineral, carbon, and nitrogen nutrition, influences of some growth substances on growth, and experiments with mushroom cultures. Over 10 pages of references are given.

Onion production, D. COMIN (*New York: Orange Judd Pub. Co., 1946, pp. 186, illus. 33*).—Prepared by a member of the staff of the Ohio Experiment Station, this book contains information on types and varieties, soil and climate requirements, planting and cultural care, production of seed and sets, harvesting and curing, control of insect and disease pests, economic aspects, and uses of the onion.

Fall production of tomatoes, J. L. BOWERS (*Miss. Farm Res. [Mississippi Sta.], 9 (1946), No. 4, p. 8*).—General information is presented on plant production, soil preparation, dipping of plants in a fungicide, planting, cultural needs, varieties, etc. Stokesdale has proved to be the outstanding variety for fall planting at State College.

Analyses of materials sold as insecticides and fungicides during 1945, C. S. CATHART and R. L. WILLIS (*New Jersey Stat. Insp. Ser. 20* (1945), pp. 11).—In the usual manner (E. S. R., 94, p. 335) information is presented on the guaranteed and found analyses of various insecticides and fungicides collected during the 1945 inspection.

Combating fruit pests in Kansas, G. A. FILINGER (*Kansas Sta. Cir. 235* (1946), pp. 52, illus. 23).—This revision and enlargement of Circular 199 (E. S. R., 84, p. 333) presents general information on pests and materials and methods for their control.

Infra-red rays and smoke for frost protection to fruit crops, C. A. DOEHLERT (*Amer. Cranberry Growers' Assoc., Proc. Ann. Conv., 76* (1945), pp. 16–17).—A brief note suggesting that atmospheric treatment by smoke generators or with infrared rays has thus far shown little or no promise for frost protection to fruit crops.

Color standards for McIntosh apple leaves, O. C. COMPTON, W. C. GRANVILLE, D. BOYNTON, and E. S. PHILLIPS ([*New York*] *Cornell Sta. Bul. 824* (1946), pp. 15, illus. 5; *Sup., [p. 1]*; *Bul. 824A, illus. 2*).—This bulletin, with supplementary data, presents seven color standards developed by the station for measuring the nitrogen content of McIntosh leaves during July, the month in the growing period when N content is changing the least. Directions are presented for collecting the leaf samples and for making readings from the chart.

Leaf N values below 2.1 percent in July indicate that slightly more N fertilizer should be applied at the next annual fertilization. Values above 2.1 percent suggest that less N fertilizer should be used. Limited observations indicated that a somewhat higher N level may be desirable in the Champlain Valley area than in other McIntosh sections of the State.

Records taken in a 23-year-old McIntosh orchard in Wayne County, where for the 3 yr. 1942–44 there was applied 7.5 lb. per tree of ammonium sulfate, showed a leaf N content of 2.22 percent in mid-July. Trees receiving 5.0 and 2.5 lb. of ammonium sulfate per annum had 2.06 and 1.88 percent of leaf nitrogen. On the basis of chart determinations the 5-lb. application was apparently near the optimum.

Breeding and improvement of peach varieties in New Jersey, M. A. BLAKE and L. J. EDGERTON (*New Jersey Stat. Bul. 726* (1946), pp. 20, illus. 10).—At the beginning of the present century peach growing in New Jersey was in a precarious condition; the San Jose scale had destroyed many orchards and growers were in doubt as to what varieties to plant. In recognition of the need, the station began a program of peach breeding to provide varieties upon which to establish a sound industry. The details of the breeding program are discussed, and the 32 varieties, 31 of peach and 1 nectarine, that have been named and introduced are described. These varieties cover the entire season, and so acceptable have they proved that they provide a large percentage of New Jersey peach production.

Experimental marketing of strawberries and peaches, C. W. HAUCK (*Ohio Sta. Bimo Bul. 240* (1946), pp. 60–64).—In cooperation with the South Carolina and Tennessee Stations studies were made of the effect of different methods of harvesting, grading, packaging, and shipping on consumer acceptance and length of salable and usable life of peaches and strawberries. The complete enclosure of berries in quart baskets by overwrapping and heat sealing in cellophane retarded mold development and dehydration. Overwrapping with flexible transparent films encouraged purchasing by store patrons, and the condensation of moisture, although obscuring contents somewhat, was not objectionable to customers. Complete covering prevented spilling and shifting of strawberries and reduced crushing in transit and losses by pilfering. Wrapped quarts were handled easier by patrons and in general stimulated purchases.

Rigid covers prevented rounding the packages and gave the appearance of not being properly filled. Paperboard packages did not prove desirable for berries. Facing the top layers of berries added to their sales appeal.

With peaches, it was evident that tree-ripened fruits commanded a premium, with customers willing to pay a differential of as much as 5 ct. a pound. Rectangular 4 and 8 qt. paperboard baskets were used successfully for delivery of tree-ripened peaches by motor truck or refrigerated rail cars.

Overwrapping peach trays with cellophane met ready customer acceptance. Soft ripe peaches might well reach the consumer in good state if graded and packed with care and if handled under refrigeration. Prompt removal of field heat from peaches would appear necessary when handling riper fruit. Brown rot was less serious in cellophane-wrapped peaches than in open containers. Consumers preferred small packages of peaches, those weighing less than 10 lb.

Breeding strawberries for high vitamin C content, G. L. SLATE and W. B. ROBINSON. (N. Y. State Expt. Sta.). (*Farm Res. [New York State and Cornell Stas.]*, 12 (1946), No. 3, p. 11).—Determinations of the vitamin C content of a large number of strawberry varieties showed great variability, from a high of 81 mg. of ascorbic acid per 100 grams of fruit in Catskill to a low of 41 mg. in Aberdeen. Sunlight intensity was also a factor, with fruits produced in direct sunlight having more ascorbic acid than those of same variety produced in the shade. Catskill is fortunately one of the leading market varieties in New York State.

Summer care of dewberries, J. P. OVERCASH (*Miss. Farm Res. [Mississippi Sta.]*, 9 (1946), No. 3, p. 8).—Cultural information is presented with relation to pruning, training, removal of fruiting canes after harvest, weeding, fertilizing, etc.

Multiflora rose for farm hedges, H. A. STEAVENSON. (U. S. D. A.). (*Jour. Wildlife Mgmt.*, 10 (1946), No. 3, pp. 227-234, illus. 1).—The need for a low cost barrier to protect farm woodland and wildlife areas against livestock became apparent early in the history of erosion-control plantings. *Rosa multiflora* has been tested as a living farm fence in the southern upper Mississippi Valley for several years and appears to be of value for these purposes and potentially even so for dividing farm fields. The discussion includes the characteristics of the plant, site and culture requirements, method of planting, barrier properties, its general and wildlife values as a living fence, and propagating and handling the planting stock.

FORESTRY

Radial growth of trees at different altitudes, R. F. DAUBENMIRE. (Univ. Idaho). (*Bot. Gaz.*, 107 (1946), No. 4, pp. 462-467, illus. 5).—Radial growth changes were followed at two altitudinal levels in four forest species, *Pinus ponderosa*, *Abies grandis*, *Larix occidentalis*, and *Thuja plicata*. In all cases the trees at the low altitude on a southern slope were growing by April 19, 1942, while those at a higher altitude on a northerly slope were not growing until mid-May. The effects of dry summer weather were seen earlier at the lower altitude, and in all four species the trees at the lower stations shrank in late summer. Shrinkage in *Pinus* was so severe that full recovery to the maximum radius recorded on July 17 was not reached on October 17. Moderate shrinkage was observed in *Pinus* and *Larix* at the upper station.

In spring temperature was evidently the most apparent factor in influencing radial growth, while in summer and early autumn the water balance gradient exerted the most influence.

The time when radial enlargement is completed varies widely among the four species and is strongly affected by altitude. In general, stability is attained at

a later date at low altitudes because the hydration of tissues formed in summer is deferred until after the rainy season begins in autumn.

37 years of windbreak planting at Akron, Colorado. R. J. PRESTON, JR., and J. F. BRANDON. (Coop. U. S. D. A.). (*Colorado Sta. Bul.* 492 (1946), pp. 21+, illus. 10).—Beginning in 1909 a total of 29 species of trees were planted in six experiments at Akron, Colo. The most durable and effective windbreak was composed of pines, with ponderosa pine making the best record of all 29 species. After 36 yr. this pine continued to grow well and retained its vigor and health. Austrian pine was only slightly inferior to ponderosa. Rocky Mountain juniper grew vigorously and is recommended for planting along the margins of windbreaks. Eastern red cedar was less vigorous although once established it maintained itself well. Among broadleaf species hackberry and American elm were best and provided good windbreak service for 15 to 20 yr. After this time many trees died and all showed serious top injury. Siberian pea-tree and chokecherry made rapid early growth.

A good all-purpose windbreak in the area could consist of 2-6 interior rows of ponderosa pine with a marginal row on each side of Rocky Mountain juniper. A few fast-growing broadleaf species could be planted on the windward side and then removed when the evergreens had reached suitable size.

Information is provided on methods of planting, cultural care, and spacing requirements.

The physical-mechanical properties of certain West Indian timbers, II (Las propiedades físico-mecánicas de ciertas maderas de las Indias Occidentales, II), R. W. WELLWOOD (U. S. Dept. Agr., Forest Serv., Caribbean Forester, 7 (1946), No. 3, pp. 191-228, illus. 12; Span., pp. 229-250; Fr. abs., pp. 250-251).—Continuing this study (E. S. R., 95, p. 669), data are reported as to the strength and related properties of motillo (*Sloanea berteriana*), a native Puerto Rican species with possibilities as a commercial timber; and Haitian pine (*Pinus occidentalis*), the most important timber of the island of Haiti and closely associated with slash or Cuban pine (*P. caribaea*) in structure and in physical-mechanical properties.

The relation between curing and durability of *Bambusa tuldoidea* (Relacion entre el metodo de curar la *Bambusa tuldoidea*), D. G. WHITE, M. CORIN, and P. SEGUINOT ROBLES. (Coop. P. R. Fed. Expt. Sta.) (U. S. Dept. Agr., Forest Serv., Caribbean Forester, 7 (1946), No. 3, pp. 253-267, illus., 4; Span., pp. 267-273; Fr. abs., p. 273).—Cut culms of *Bambusa tuldoidea* of different ages were treated variously: (1) Clump cured for 28 days, (2) submerged in water for 130, 161, and 192 days, (3) clump cured for 14 days followed by submergence for 135 days, and (4) stored immediately in a shed (control). After treatment all culms were stored in an open shed, and observations made on powder-post beetle damage, clump curing, water submergence for 130 to 192 days, or a combination resulted in a significant reduction in insect injury. Clump curing gave equally good results as other treatments and involved less cost.

As to the effect of age of culm, those cut at 6 mo. had significantly less injury than older culms. At the same time culms of 36 and 42 mo. were injured less than those from 12 to 30 mo. old. Beetle injury was more evident in the basal than in the distal sections of culms.

The number of beetle holes which appeared in the first month of exposure was indicative of future total infestation. Even with the most effective curing treatment there was 66.7 percent of infestation, indicating that the species of bamboo used is relatively susceptible to powder-post beetle injury.

Submergence treatments stained the wood to such an extent that it could not be used where a good finish was needed. There was also considerable splitting of internodes in the submerged culms.

DISEASES OF PLANTS

The Plant Disease Reporter [June 15 and July 15, 1946] (*U. S. Dept. Agr., Plant Disease Rptr.*, 30 (1946), Nos. 6, pp. 175-216, illus. 4; 7, pp. 217-263, illus. 8).—These issues contain the following notes and articles:

No. 6.—Host-parasite check list revision—*Trifolium-Trigonella* (Leguminosae), by F. Weiss; the distribution of parasitic nematodes on economic plants in Idaho, by E. C. Blodgett; the spread and development of cucurbit downy mildew in Atlantic Coastal States in 1945, by C. J. Nusbaum (S. C. Expt. Sta.); plant diseases in Palm Beach, Broward, and St. Lucie Counties, Fla., during April, by G. R. Townsend, R. C. Cassell, E. L. Felix, and R. Desrosiers (Fla. Everglades Sta.); greenhouse vegetable diseases of interest in New York, by A. G. Newhall (Cornell Univ.); preliminary experiment indicates that 2, 4-D (2, 4-dichlorophenoxyacetic acid) treatment of tomato may reduce losses due to fruit crack molds, by W. T. Schroeder and F. G. Smith (N. Y. State Sta.); seed protectants on sweet corn in relation to plant vigor, by B. H. Davis and C. M. Haenseler (N. J. Stas.); reports on tobacco blue mold in South Carolina, Kentucky (Ky. Sta.), and Maryland (Univ. Md.); peach wart found in California, by G. L. Stout and R. L. McClain; sour cherries in Virginia killed as a result of 1945 leaf spot epiphytotic, by A. B. Groves (Va. Sta.); spread of white pine blister rust during 1945, by J. F. Martin; dieback and stem canker of camellia, by D. C. Bain (Miss. Sta.); a disease of English ivy in Georgia, by K. H. Garren (Ga. Sta.); an epiphytotic of verticillium wilt in southern California, by K. F. Baker and W. F. Locke (Univ. Calif.); and brief notes on sweetpotato internal cork in Georgia (Univ. Ga.), a field test of late blight resistance in tomatoes, and germination of tobacco seed prevented by cyanamid (Ky. Sta.).

No. 7.—Host-parasite check list revision—*Vicia-Vigna* (Leguminosae), by F. Weiss; zoospore development from oospores of *Pythium ultimum* and *P. debaryanum* and its relation to rootlet-tip discoloration, by C. Drechsler; tobacco blue mold in Georgia, by J. G. Gaines; blue mold in Kentucky in 1946, by W. D. Val-leau and E. M. Johnson (Ky. Sta.); late blight as reported on potato and tomato in Maryland (Univ. Md.), Pennsylvania (Pa. State Col.), and Georgia (Univ. Ga.); occurrence of corky ringspot of potatoes in Florida, by A. H. Eddins, E. Q. Procter, and E. West (Fla. Sta.); fumes from 2-4-D cause injury to tomato, cabbage, and pepper plants, by E. M. Johnson and P. O. Ritcher (Ky. Sta.); plant disease survey in the Everglades and contiguous areas during the 1945-46 season, by G. R. Townsend, R. C. Cassell, E. L. Felix, and R. Desrosiers (Fla. Everglades Sta.); alfalfa and clover diseases in Virginia, by S. B. Fenhe, C. L. Lefebvre, R. G. Henderson, and T. J. Smith (Va. Polytech. Inst.); rusts of small grains in Texas, by I. M. Atkins; azalea flower spot appears in Maryland, by P. Brierley; observations on azalea flower spot in Maryland, by F. Weiss; brief notes on lettuce rust in New York (Cornell Univ.) and sour cherry yellows in North Carolina (N. C. Sta.); observations on coffee root rot in El Salvador, by F. L. Wellman; and the loss from cotton wilt and the tempo of wilt development—a study of new uses for old data, including discussion and graphical presentation of the data and planning of future cooperative programs, by K. S. Chester (Okla. A. and M. Col.).

The Plant Disease Reporter, Index to Volume XXVIII, 1944, N. W. NANCE (*U. S. Dept. Agr., Plant Disease Rptr.*, 28 (1946), No. 40, pp. 1191-1266).

Report of the 1946 annual meeting of the New England Division of the American Phytopathological Society (*Phytopathology*, 36 (1946), No. 8, pp. 679-683).—Abstracts of 14 papers by various authors—including experiment station and U. S. Department of Agriculture workers—are presented on the following subjects: *Alternaria solani* defoliation of New Hampshire Victor tomatoes as

influenced by inorganic fertilizers, fungicidal control of alternaria blight on tomatoes, fungicidal stimulation and retardation of germination in vegetable seeds, damping-off control by delayed watering after seeding, Dutch elm disease studies in Massachusetts, soil applications of oxyquinolin benzoate against foliage wilting in graphium-infected elms, spray penetration v. apple leaf structure, common scab incidence on Green Mountain potatoes v. pH of soil, tobacco pole-rot fungi, permeation v. toxicity of fungicides, concentration, pressure, time, and orifice interactions in spraying, stability assay of organic fungicide residues, and glyoxalidine derivatives as foliage fungicides studied in laboratory and field.

Report of the third annual meeting of the Potomac Division of the American Phytopathological Society (*Phytopathology*, 36 (1946), No. 8, pp. 684-689).—Abstracts of 24 papers by various authors—including State experiment station and U. S. Department of Agriculture workers—are presented on the following subjects: Effects of fungicides and growth substances on field production of Easter lily bulbs, effects of fungicide-growth-substance combinations on herbaceous cuttings, possible growth-regulating effects of several fungicides, factorial studies on Dithane plus zinc sulfate-lime—the “reaction product” (zinc ethylene bisdithiocarbamate), seed treatment of castor-beans against seedling blight, seed treatment effects on soybeans germinated at four temperatures, apparatus and field plot design for evaluating fungicides on vegetables, field control of bean rust with sulfur, *Lycopersicon hirsutum* lines resistant to common tobacco mosaic, field occurrence of a tobacco etch virus strain in sweet peppers, tobacco resistant to root knot and nematode root rot, tobacco blue mold control by aerosol treatments, barley seed inoculation method for *Helminthosporium graminum*, status of disease-resistance breeding in oats, golden nematode as a quarantine problem, golden nematode as a disease agent (distribution, hosts, character, and significance), soil fumigation against golden nematode, golden nematode on commercial potatoes, nature of net necrosis of potato (leafhopper injury?), progress on tropical American rubber planting through disease control, regional differences in resistance of *Hevea* selections to South American leaf blight, Dutch elm disease spread in Maryland, rate of spread of blueberry stunt in a North Carolina field, and yellows-type strawberry virus in eastern United States.

[**Papers on plant diseases and their control**] (*Ohio Veg. and Potato Growers Assoc. Proc.*, 29 (1944), pp. 49-58, 80-90, 97-109, 138-152).—The following papers are included: Spray and Dust Formulas for the Control of Vegetable Diseases in Ohio, by J. D. Wilson (pp. 49-58), and Spray Intervals and Potato Yields, by H. L. Gui, J. P. Slesman, and J. D. Wilson (pp. 104-109) (both Ohio Expt. Sta.); Virus Diseases Affecting Vegetable Crops in the Field (pp. 80-90) and The Virus Diseases Affecting Tomatoes and Cucumbers in the Greenhouse (pp. 138-152), both by S. P. Doolittle (U. S. D. A.); and Soil Fumigation in Greenhouses and Outdoor Seed Beds With Chlorpicrin and Other Promising Materials, by J. M. Bickerton (pp. 97-103).

Virus diseases of plants and their insect vectors with special reference to Hawaii, D. D. JENSEN. (Hawaii Expt. Sta.). (*Hawaii. Ent. Soc. Proc.*, 12 (1946), No. 3, pp. 535-610).—The subject matter of this monographic contribution is presented under (1) the principles of insect transmission of plant viruses, (2) insect species in Hawaii known to transmit plant viruses with a list of viruses transmitted by each, and (3) plant virus diseases known or reported to occur in Hawaii with special reference to their insect transmission. A review of the literature (251 references) reveals that although a considerable number of plant viruses occur in Hawaii, most of them have received only passing notice. Those most extensively investigated are yellow spot of pineapple (spotted wilt of tomato), sugarcane mosaic and chlorotic streak, corn mosaic, and to a lesser

extent papaya and commelina mosaics. Other viruses occur in truck crops, banana, ornamental flowers, and weed hosts. The increasing importance assumed by diversified crops in Hawaii has resulted in a greater awareness by entomologists and pathologists of the importance of virus diseases on these various crop plants; furthermore the number and importance of the associated problems usually increase as the acreage devoted to economic plants is enlarged.

A physiological and biochemical basis for research on fungicides, D. GOTTlieb. (Univ. Ill.). (*Bul. Torrey Bot. Club*, 73 (1946), No. 4, pp. 339-345).—In this general critical discussion, the emphasis on fundamental studies of the physiology and biochemistry of the fungi as an aid to fungicide development is not proposed as an alternative method to empirical research; rather, it is suggested as a guide for such investigations into areas of biochemical reactions concerned with the vital processes of the fungus and where the empirical methods could be most effectively employed. In addition, fundamental studies of the living organism can furnish clues to the type of organic molecule which effectively inhibits the biochemical reactions necessary to the life of the organism. Finally, such research can put plant protection on a basis of rational scientific principles. There are 21 references.

Trials with zinc-bearing dusts, J. C. JOHNSTON. (Univ. Calif.). (*Calif. Citrog.*, 31 (1946), No. 10, pp. 406-407).—In the series of field trials (1934-35) reported, the dusts were, in general, not as effective as sprays in citrus mottle leaf control, though in a 1934 test "for practical purposes adequate control was secured with the 4 percent dusts where the zinc was derived from zinc sulfate, zinc oxide, and metallic zinc."

Effect of hydrogen-ion concentration on the toxicity to *Colletotrichum circinans* (Berk.) Vogl. of some carboxylic acids, phenols, and crucifer extracts, F. G. SMITH, J. C. WALKER, and W. J. HOOKER. (Univ. Wis.). (*Amer. Jour. Bot.*, 33 (1946), No. 5, pp. 351-356, illus. 3).—The authors observed the toxicity of ether-soluble strong acid fractions of crucifer extracts to be correlated with pH. A study of the variation in toxicity with the pH of extracts and several typical phenols and carboxylic acids was then made by determining the percentage of spore germination. Plotting logarithms of LD50 values against pH gave characteristic curves for each group of toxicants. The carboxylic acids exhibited nearly parallel linear curves with toxicity decreasing in the order, benzoic, protocatechuic, and acetic acids. Calculated pH-LD50 curves for the undissociated acid fraction did not altogether support the hypothesis that this molecular species is responsible for the toxicity of carboxylic acids at various H-ion concentrations. Hydroquinone and catechol showed distinctly different curves than the acids. The marked increase in toxicity at pH 7, especially with the former, and comparison with the toxicity of the corresponding *p*-quinone suggested that autoxidation to quinone had taken place. The curves for crucifer extracts indicated carboxylic acids or similar toxicants to be largely responsible for toxicity. These findings suggest two possible mechanisms by which relatively small differences in pH may produce changes in fungicidal activity of importance in natural disease resistance or in the application of commercial fungicides. There are 31 references.

Rootrots and leafspots of grains and grasses in the northern Great Plains and Western States, R. SPRAGUE. (Coop. N. Dak. Expt. Sta.). (*U. S. Dept. Agr., Plant Disease Rptr.*, 1946, Sup. 163, pp. 101-268).—This annotated list contains at least mention of all the parasites known by the author to attack the grass family in the western United States and includes some 200 fungus species on nearly 500 hosts. Though this preliminary work is not considered a text, it is somewhat more than a list and the author believes that it may have some value

to a number of western experiment station workers and field men in the routine diagnosis and study of the lesser-known leaf spot and root rot diseases of grasses and cereals. Since brevity was necessary, it was felt that some of the better-known parasites should be given less space than some of the little-known ones, as information on the latter is frequently buried in obscure journals. Included are 13 Phycomycetes, 24 Ascomycetes (if 15 species of *Phyllachora* are admitted), 8 Basidiomycetes, and 162 Fungi Imperfecti, as well as a few undetermined or nonparasitic troubles. In addition, brief mention is made of associated non-parasitic saprophytes which are sometimes such early invaders of dead tissue that they have in some cases been considered weakly parasitic. A table indicates the number of species of leaf spot and root rot fungi reported on Gramineae in each of 17 Western States.

Distinguishing characteristics of some forage-grass diseases prevalent in the North Central States, J. L. ALLISON and D. W. CHAMBERLAIN. (Coop. Wis. Expt. Sta.). (*U. S. Dept. Agr. Cir.* 747 (1946), pp. 16, illus. 16).—This circular brings together available information on the more important diseases of pasture and forage grasses in the above region, emphasis being placed on the distinguishing characteristics of each disease but without attempting to include all hosts or all diseases known to occur in the area. The development of resistant strains offers the only practical control measure; resistance to many of the diseases reviewed has been demonstrated. The presence of physiological races in certain of the fungi discussed has been recognized. Improvement programs are in progress with all the major grass species here considered.

Effect of soil temperature on the development of rhizoctonia root canker of alfalfa, O. F. SMITH. (Nev. Expt. Sta. and U. S. D. A.). (*Phytopathology*, 36 (1946), No. 8, pp. 638-642, illus. 3).—The optimum temperatures for growth of *Rhizoctonia solani* on potato-dextrose agar, as well as the soil temperature for development of the root canker on alfalfa, proved to be about 25°-30° C. Very few cankers developed within 50 days below 20° or above 35°. In the field, very few root cankers developed before the soil had warmed to 20° or higher in spring, and they ceased to develop in the fall after the soil cooled to about 20° or below.

Temporary immunity in alfalfa ordinarily susceptible to attack by the pea aphid, W. T. EMERY. (U. S. D. A.). (*Jour. Agr. Res.* [U. S.], 73 (1946), No. 2, pp. 33-43, illus. 5).—Alfalfa plants that are highly susceptible to the pea aphid in some seasons do not support an aphid population in other seasons. Results show that temporary immunity to their feeding is associated with an acid condition in the plant and that this acidity may be caused by (1) a deficiency of water, (2) a deficiency of light for photosynthesis, (3) temperatures too low for rapid growth of alfalfa, and (4) temperatures sufficiently high to cause the formation of lignin. Measurements of the cell sap for osazones have shown that aphids feed most on the elongating internodes, where growth is rapid and where sucrose is most abundant. Since the synthesis of protein is dependent on a "carbohydrate-nitrogen ratio," it is thought that resistance in alfalfa to the pea aphid is correlated primarily with an acid condition and a scarcity or absence of sucrose rather than with a scarcity of proteins in the plants.

What's the matter with our barley? K. S. QUISENBERRY and O. J. WEBSTER. (U. S. D. A. coop. Nebr. Expt. Sta.). (*Nebr. State Bd. Agr. Ann. Rpt.*, 1945, pp. 204-214, illus. 3).—The authors present evidence showing that during the last 25 yr. barley production in Nebraska has fluctuated rather widely; during the past 5 yr., the performance was very poor as compared with some earlier years or with the production of oats. Poor yields have been due to a number of causes, such as unfavorable weather, disease and insect injuries, and lack of hazard-

resistance in the adapted varieties. To increase the chances of success with barley, farmers are advised to obtain certified seed of recommended varieties and to treat it with the proper fungicidal dusts. The crop should be seeded as early in spring as possible and on a well-prepared seedbed. Barley should not follow corn, wheat, or barley in the rotation if these crops have shown scab the previous year unless all crop refuse is well covered. Where heavy infestations of chinch bugs are expected, barley should not be seeded at all. Winter barley is considered somewhat of a risk because of its lack of winter hardiness; of the available varieties, Reno and Ward are considered the best.

Association of *Xanthomonas phaseoli* and the common bean-mosaic virus, Marmor phaseoli, II, III. (U. S. D. A.). (*Phytopathology*, 36 (1946), No. 8, pp. 589-623, illus. 7).—Two additional papers (E. S. R. 91, p. 698) are presented:

II. *Dissociation studies of X. phaseoli*, F. Hedges (pp. 589-612).—The author studied dissociation in an isolate of *X. phaseoli* (P(M+P)³⁴) from a badly stunted plant of the thirty-fourth serial passage from bean to bean plants of juice containing the two infective agents *X. phaseoli* and the virus of common bean mosaic. This serial passage had shortly preceded (1) one in which all bacterial symptoms disappeared from the inoculated plants and (2) the sudden onset of ultra-severe mosaic which followed in the thirty-eighth serial passage and persisted in those ensuing. Parallel studies were also made of a "normal" strain of *X. phaseoli*, with no history of mosaic virus association, isolated from a lima bean pod. The investigation was undertaken to show whether changes had taken place in the bacterium during its 2-yr. association with the virus in vivo which might account for its decreased virulence and failure to maintain continuously its "typical" form in the host tissues as earlier described. A. J. Quirk's technic of dissociation was employed.

Dissociated cultures of the two strains showed striking differences between P(M+P)³⁴ and the normal strain of *X. phaseoli*. In the former the mildly infectious R-S opaque white and the nonpathogenic S pink variants developed at the expense of the typical virulent S yellow form. In the dissociated normal strain, on the other hand, the virulent S yellow form dominated markedly. The dissociation phenomenon and the difference between the two strains were far better demonstrated on Quirk's media II, III, and IV than on the media commonly used for phytopathogenic bacteria. Inoculation tests with various dissociated cultures of the two strains revealed that when the R-S white variant was dominant infection was poor or only fair, the degree of pathogenicity being directly proportional to the amount of the typical S yellow form of *X. phaseoli* in the inoculum.

III. *The effect of varying amounts of nitrogen on pathogenicity*, F. Hedges and H. Fisher (pp. 613-623).—The effects of varying amounts of N—9.8, 200, and 2,000 p. p. m.—were tested on sand cultures of Stringless Green Refugee bean seedlings inoculated with (1) juice from serial passages from bean to bean plants of expressed bean juice containing *X. phaseoli* and common bean mosaic virus, (2) pure single-colony cultures of *X. phaseoli*, and (3) juice from serial passages of bean juice containing common bean mosaic virus. These serial passages had been carried on over a period of years and described in an earlier paper by Hedges. The best development of both virus and bacterium in all sets was induced by the medium concentration of N (200 p. p. m.); this was also optimum for the host. Pathogenicity tests were made of expressed juice from plants in which the two infective agents were associated. The results indicated that the virus had not been permanently inhibited by any of the three N concentrations; on the other hand, N at both 9.8 and 2,000 p. p. m.

malformed, and the growing point is pinched together in a cluster of small leaves. The leaflets on the young leaves cup upward, forming small boatlike structures. The infection was transmitted by grafting stems of affected Netted Gem potatoes to healthy Netted Gem, White Rose, Burbank, Green Mountain, and virus X-immune seedlings.

Resistance of potato seedling varieties to the natural spread of leaf roll, D. FOLSOM and F. J. STEVENSON. (Maine Expt. Sta. and U. S. D. A.) (*Amer. Potato Jour.*, 23 (1946), No. 7, pp. 247-264).—Seedling potatoes were exposed to leaf roll infection from adjacent field rows in an area where the disease had spread consistently year after year. The parents at first used included commercial American and European varieties reputed to be resistant to this virus; a few of the crosses employed also contained some seedlings resistant to the spontaneous spread of leaf roll. When the latter were used as parents, the resulting crosses were usually more resistant to field spread than other kinds of crosses. Greater resistance in one of the parents did not always mean resistance in the cross. Furthermore, higher resistance in a cross (judged by percentage of seedlings showing leaf roll) was not necessarily correlated with the percentage of total plants exhibiting the disease in the infected seedlings. Field resistance in given seedlings and varieties differed from one season to another on the same farm. Although aphids are probably important in the field spread of leaf roll, aphid resistance in seedlings is not necessary for field resistance to infection. It is possible to combine field resistance to leaf roll with many characteristics considered commercially desirable in the United States. There are 31 references.

Golden nematode of potatoes jumps the Atlantic, A. G. NEWHALL. ([N. Y.] Cornell Expt. Sta.) (*Farm Res. [New York State and Cornell Stas.]*, 12 (1946), No. 3, pp. 6, 7, illus. 1).—This contribution indicates that the golden nematode—never before found in America—probably appeared in Nassau County, Long Island, about 1930; by 1941 nearly all of a 50-acre field was badly infested. Insofar as known, this serious potato disease is confined to that county; intensive research is under way to find effective control measures, and every precaution is being taken to prevent its further spread. The symptoms of infestation are briefly described.

Grain storage studies.—III, The relation between moisture content, mold growth, and respiration of soybeans, M. MILNER and W. F. GEDDES. (Minn. Expt. Sta.). (*Cereal Chem.*, 23 (1946), No. 3, pp. 225-247, illus. 4).—In this contribution (E. S. R. 94, p. 464), the influence of moisture content on the respiratory characteristics of soybeans of varying commercial quality at 37.8° C. was studied by a technic providing for simultaneous measurement of O₂ consumption and CO₂ production under continuous and controlled aeration for periods up to 15 days. Moisture below about 14 percent yielded very low but virtually constant respiratory rates over extended periods, indicative of seed respiration only. Small moisture increments beyond this were accompanied by respiratory increases for several days until equilibrium was approached; this effect was due to mold growth, the plotted respiration values thus assuming the form of a microbiological growth curve. The latent period of mold spore germination decreased with increasing moisture. Frost-damaged seeds gave shorter respiratory lag periods and considerably higher respiration rates than normal seeds, as well as lower critical moisture values. These differences are ascribed primarily to the greater concentration and ready availability of nutrients for mold growth in damaged than in sound seeds.

The respiratory characteristics of autoclave-sterilized soybeans at various moisture levels, inoculated with spores of molds indigenous to normal soybeans, exhibited the same characteristic sharp upward trend in respiration at a critical

had markedly inhibited the bacterium. However, when isolates of the bacterium from the same three N sets were first grown in a favorable medium (steamed potato cylinders) and then used as inoculum, all were highly virulent, though the isolate from the medium N concentration (200 p. p. m.) was notably more so.

Helminthosporium turcicum leaf blight of corn, C. ELLIOTT and M. T. JENKINS. (U. S. D. A.). (*Phytopathology*, 36 (1946), No. 8, pp. 660-666, illus. 2).—In field inoculation tests of corn with *H. turcicum* at Beltsville, Md. (1944), most of the inbred lines and crosses proved susceptible but a few lines were resistant; the earlier maturing lines and crosses were, in general, more susceptible than later lines and crosses; NC34 was outstanding in its resistance and in transmitting resistance to its crosses; CI.23, K175, Ky114, Mo21A, T49B, T105B, K155, CI.15, CI.16, and Tx206 had only traces to light infection; the other lines showed moderate to very heavy infection. In general, the resistance of resistant lines was transmitted to their hybrids.

A new seed-borne disease of oats, W. F. CROSIER. (N. Y. State Expt. Sta.). (*Farm Res. [New York State and Cornell Stats.]*, 12 (1946), No. 3, p. 5).—The Vicland variety of oats was found especially susceptible to a new fungus blight and root rot caused by *Helminthosporium* sp. with all seed stocks tested at Geneva showing infection. Desirable new varieties such as Boone, Cedar, Fultex, Letoria, and Neosho—though free from crown rust—proved extremely susceptible to the new disease; strong indications were that resistance to rust is linked with susceptibility to the *Helminthosporium*. Fortunately some of the older varieties of oats (Cornellian, Ithacan, and Lenroc) have not been attacked. Almost complete control of this seed-borne blight was obtained by seed treatment with a volatile mercury dust—either new Improved Ceresan or duPont 1452F.

Late blight on potato and tomato in 1946 (U. S. Dept. Agr., *Plant Disease Rptr.*, 1946, Sup. 164, pp. 269-296, illus. 5).—Reports that *Phytophthora infestans* infection was appearing to an alarming extent were received from several commercial tomato-growing areas. With the aim of presenting a systematic and timely account of the development of the disease in 1946 on its two important hosts, the Plant Disease Survey asked its collaborators in States where late blight is likely to occur to send reports of its incidence on potato and tomato (either or both), especially as to the following points: "Has the disease occurred on either host and to what extent? What control measures, if any, have been taken? When was the disease first noted, and what in your opinion was the original source of infection?" The answers to these questions—except for a few negative replies—are presented here. Together with reports from various Florida sections that have appeared in each number of the *Reporter* from December 1945 to the current issue, they give a rather complete story of the occurrence of the disease to about the middle of June 1946.

Some of the factors brought out in the reports may be briefly indicated: Weather was unusually favorable for late blight development over a long period of time and over a widespread area; the disease is reported as appearing much earlier in several States in 1946 than previously; the reports from State pathologists and collaborators as to original sources of infection raise an interesting question of reciprocal responsibility, which is discussed.

Green dwarf: A virus disease of potato, J. A. MILBRATH. (Oreg. Expt. Sta.). (*Phytopathology*, 36 (1946), No. 8, pp. 671-674, illus. 2).—A previously undescribed tuber-transmitted virus disease of potatoes, called green dwarf, is reported from several counties in Oregon. The outstanding symptoms are late emergence and extreme dwarfing. The basal leaves appear normal, but are close together in a rosette of four to five leaves. The terminal growth is dwarfed and

value as did normal seeds; the low respiration values of normal seeds at lower moisture levels (seed respiration) were absent. Wetting or heating of normal soybeans caused an initial evolution of CO_2 apparently not related to respiration; this was attributed to the release of preformed CO_2 bound by the dormant seeds. Respiratory quotients increased with the moisture content and approached 1.0 as the ratio of mold- to seed-respiration increased. When seed respiration was absent (autoclaved mold-inoculated seeds), the respiratory quotient of 1.0 exhibited by the mold respiration was unaffected by moisture content. The viability of soybeans decreased somewhat when the seeds were held at 37.8° at moisture levels below those favoring mold growth, but were most adversely affected at moisture contents where molds grew readily. Only slight changes with time in the chemical composition of respiring soybeans were noted at moisture values unfavorable to mold growth; at those where molds proliferated, drastic chemical changes occurred and were approximately proportional to the moisture content and extent of mold growth. Significant increases in the moisture content of soybeans maintained in atmospheres of constant humidity in equilibrium with the seed moisture were observed when mold growth was extensive. At the same relative humidity, mold mycelia are probably more hygroscopic than are soybeans.

Aspergillus glaucus and *A. flavus* were the principal fungi proliferating on soybeans within the moisture range studied; the latter required a moisture value some 3 percent higher for germination. The literature reviewed (about two pages of references) indicated that a few mold types can germinate and grow at relative humidities as low as 75 percent; an increasing diversity of microfloral species appears at higher humidities. Relative humidity rather than the actual moisture content of seeds determines their susceptibility to molding. It is concluded that the various "critical" moisture values for different seed species are those which are in hygroscopic equilibrium with a common relative humidity of about 75 percent which, over moderate time intervals, is the minimum humidity required for growth of most of the xerophytic mold species contaminating the seeds.

Yellow wilt of sugar beet in Argentina, C. W. BENNETT and C. MUNCK. (U. S. D. A. et al.). (*Jour. Agr. Res. [U. S.]*, 73 (1946), No. 2, pp. 45-64, illus. 8). —A disease, given the suggested name "yellow wilt," has caused severe damage to sugar beets in the Río Negro Valley, probably since the industry was first established there in 1929. One phase is characterized by stunting, yellowing of the foliage, slight stimulation of development of axillary buds, and leaf malformation; wilting and rapid killing of plants are characteristic of another phase. Plants are usually attacked after attaining considerable size. In the greenhouse, the disease was transmitted by grafting to healthy tissue and by each of two species of dodder (*Cuscuta subinclusa* and *C. campestris*), but not by juice inoculation. Field observations indicated a leafhopper (*Atanus exitiosus* Beamer) to be the vector. The evidence indicates that yellow wilt is caused by a previously unknown virus, for which the designations *Chlorogenus patagoniensis* n. sp. and Beta virus 6 are proposed in accordance with the systems of classification and nomenclature of Holmes and of Smith, respectively. In extensive tests in two seasons, involving 20 European varieties and 2 varieties from the United States the first season and 28 European varieties and 2 varieties from the United States the second season, no evidence was obtained of an appreciable amount of resistance in any variety of sugar beet. Satisfactory control measures for the disease have not been developed. Plantings made after the middle of December escape infection in the Río Negro Valley, but this date of planting is too late for maximum yields. Selection and propagation of healthy beets from badly infested

fields have not resulted in increased resistance in the progeny. Other possible methods of control have not been tested.

Stem distortion of wheat, E. C. BLODGETT and H. K. SCHULTZ. (Idaho Expt. Sta.) (*Jour. Amer. Soc. Agron.*, 38 (1946), No. 8, pp. 717-722, *illus.* 2).—A characteristic type of stem distortion in wheat was found perpetuated from season to season by the seed of winter wheat. Although the possibility that insects or parasitic organisms are involved is not definitely precluded, the indications are that the condition may be caused by some genetic factor or by a virus. There is some resemblance between the symptoms of stem distortion and those due to injury by the western wheat aphid. Although certain facts have been established, it is desirable to study the condition further.

Experiments on the overwintering in the soil of bacteria causing leaf and pod spots of snap and lima beans, F. HEDGES. (U. S. D. A.). (*Phytopathology*, 36 (1946), No. 8, pp. 677-678).—The soil hold-over of *Pseudomonas medicaginis phasecolica*, *Xanthomonas phaseoli*, and *P. syringae* was tested by growing susceptible varieties of snap and lima beans in soil where leaves, pods, and stems of plants severely infected with one or more of these organisms had been buried the preceding fall. The results of all these field experiments—carried out on the Eastern Shore of Maryland and in Virginia—were negative. Soil in which lima bean leaves infected with *P. medicaginis phasecolica* had been buried in October failed to produce infection when dusted on pricked and sprayed lima bean plants in damp chambers the following June. When lima bean leaves infected with *P. syringae* and exposed to weathering without contact with the soil from October until June were used as inoculum, being crushed to powder and dusted on sprayed and pricked lima bean seedlings in damp chambers, no infection resulted.

Fermate does control cucumber anthracnose, F. J. LEBEAU. (La. Expt. Sta.). (*Food Packer*, 27 (1946), No. 8, pp. 67-68, *illus.* 3).—In the 2 years' tests reported, a 10-percent Fermate dust is said to have given practically 100 percent control and without apparent injury to the plants; bordeaux and yellow Cuproside caused considerable damage, so that frequently the gain from disease control was overbalanced by the injury. In tests with other plants, Fermate has also been outstanding against anthracnose, suggesting that it may prove highly specific for this class of disease.

Apple scab and its control, A. B. BURRELL. (Cornell Univ.). (*Amer. Fruit Grower*, 66 (1946), No. 1, pp. 10-11, 30, 39-41, 49, *illus.* 6).—A general summary of present knowledge on this disease and its control, with seasonal notes and experimental data from New York State.

Machinery for applying scab control sprays and dusts, A. B. BURRELL. (Cornell Univ.). (*Amer. Fruit Grower*, 66 (1946), No. 2, pp. 18-19, 37-39, 43, 45, *illus.* 7).—A general discussion of the different types of machinery used in apple scab control, including attachments to standard spray equipment, newer kinds of sprayers, small- and large-volume machines, the more rapid application of dusts as compared with sprays, and labor costs.

Transmission of peach wart by graft inoculations with affected fruit tissue, E. C. BLODGETT. (Idaho Expt. Sta.) (*Phytopathology*, 36 (1946), No. 8, p. 675).—Three J. H. Hale and three Elberta peach trees in plots at Moscow, Idaho, were inoculated in August 1942 with wedges of warty fruit tissue; examination in 1945 showed that the virus had in every case been transmitted. The fruit tissue wedges—held in place in T-shaped cuts in the trunk by rubber bands—remained green and apparently alive for at least a month. Trees not inoculated with peach wart either by buds or fruit tissue failed to become affected. This technique offers a useful means for studying the peach wart virus.

Control of leaf curl and "pockets" of the sand cherry, W. F. BUCHHOLZ. (S. Dak. Expt. Sta.) (*S. Dak. State Hort. Soc. Ann. Rpt.*, 42 (1945), pp. 37-38).—The results of a 3-yr. series of tests show that the taphrina leaf curl and pockets of sand cherries can be controlled by a dormant spray with lime-sulfur (1-10) applied in the fall or early spring; whether or not the same will apply to plum pockets remains to be determined.

Ten additional leafhopper vectors of the virus causing Pierce's disease of grapes, N. W. FRAZIER and J. H. FREITAG. (Calif. Expt. Sta.). (*Phytopathology*, 36 (1946), No. 8, pp. 634-637).—The following leafhoppers are shown to be vectors of the virus of Pierce's disease of grapes: *Carneoccephala triguttata* Nott., *Neokolla gothica* (Sign.), *N. confluens* (Uhler), *N. heiroglyphica* (Say), *Cuerna occidentalis* Oman & Beamer, *Pagaronia triunata* Ball, *P. 13-punctata* Ball, *P. furcata* Oman, *P. confusa* Oman, and *Friscanus friscanus* (Ball). None appeared to be important in the spread of the virus to alfalfa or grape in the field. All 10 species are in the leafhopper subfamily Tettigoniellinae, as are 4 previously reported vectors; all members of the group thus far tested have transmitted the virus. Over 50 species of leafhoppers in other subfamilies were tested, but none spread the infection. The evidence at hand suggests that the ability to transmit the virus can be correlated with a phylogenetic relationship of vectors within the Tettigoniellinae.

Control of chlorosis in citrus leaves, A. R. C. HAAS and G. A. ZENTMYER. (Calif. Citrus Expt. Sta.) (*Calif. Citrog.*, 31 (1946), No. 9, pp. 334-335, 346-348, illus. 4).—Numerous attempts have been made to control chlorosis, as, e. g., by soil, trunk, branch, or leaf treatments; none of these methods have been fully satisfactory and many have proved injurious to the trees. Much of the difficulty from inorganic Fe compounds has resulted from their acidity, rapid precipitation, or relative insolubility. Use of the organic fungicide, Fermate, as a dust or spray was found of value as a source of Fe in controlling chlorosis; a uniform deposit of active Fe over the leaf and axils of the petioles is essential. Adjustment of water to about pH 5 for spraying and addition of S in amounts insufficient to cause burning aided in maintaining the Fe solubility of the spray deposit; the S is also useful in dust applications. A suitable spreader or sticker may serve to establish and maintain contact of the Fe particles with the leaf surfaces. Magnetite was likewise used and found to offer control. Very chlorotic orange leaves exhibited considerable uniform improvement 11 days after dusting with Fermate or magnetite—both with the added S. Use of acid fertilizers, control of soil moisture, encouragement of shallow rooting, and recognition that all alkaline calcareous soils are potentially capable of inducing chlorosis should aid in its prevention. Laboratory tests with Fe sources quite different from those previously used offer considerable promise. Maintaining the Fe applied to the leaves in an available form via acidifying rather than alkalizing agents should increase the effectiveness of control measures.

Stubborn disease of citrus, a virosis, H. S. FAWCETT. (Calif. Citrus Expt. Sta.) (*Phytopathology*, 36 (1946), No. 8, pp. 675-677).—This malady of navel orange trees was shown by transmission tests to be of a virus origin. The symptoms consist of a brushlike growth of twigs developing from multiple buds, leaves broader and shorter than normal and becoming chlorotic in the fall and winter, and fruits fewer in number and some of them acorn-shaped, on which the rind at the stem end is normal but becoming abruptly thinner and smoother over the rest of the surface. The virus is named on the basis of symptoms produced and described for the first time as *Citriwir pertinaciae*.

Diseases of the walnut in the Pacific Northwest and their control, P. W. MILLER, C. E. SCHUSTER, and R. E. STEPHENSON. (Coop. U. S. D. A.). (*Oregon Sta.*

Bul. 435 (1945), pp. 42, illus. 29).—The Persian (English) walnut (*Juglans regia*) in the Pacific Northwest is attacked by a number of diseases that adversely affect the growth of the trees and the quality and yield of the nuts. It is the purpose of this bulletin to provide the grower with information that will enable him to recognize these diseases and to employ against them effective control measures where known.

Dieback of camellia, D. C. BAIN (*Miss. Farm Res. [Mississippi Sta.], 9 (1946), No. 4, pp. 2, 5*).—The author describes a dieback of camellia which for several years has been prevalent in Mississippi and other States—particularly in nurseries along the Gulf coast. There are strong indications that the dieback later develops into a canker. Bits of material from both forms were cultured and the same fungus—a *Gloeosporium*—was isolated from each; furthermore, inoculations from the pure cultures have produced the dieback symptoms. Spray tests against the disease are being carried out, and some indications of resistant varieties have been observed.

Decay following glaze storm damage in woodlands of central New York, P. SPAULDING and A. W. BRATTON. (U. S. D. A.). (*Jour. Forestry, 44 (1946), No. 7, pp. 515-519, illus. 3*).—Northern hardwood stands in Otsego and Herkimer Counties were severely damaged by an ice storm in December 1942. Early in 1945 sap rot had developed at the bases of injured but living sugar maple and beech trees. The initial injury was apparently due to sunscald caused by sudden opening of the stands. The silvicultural significance of the sap-rot fungi attacking injured trees is indicated. *Daedalea unicolor* was found fruiting on nearly every sap-rotted tree and evidently was one of the first fungi to attack them. Other fungi of the so-called sap-rot-producing species were *Peniophora* sp., *Polyporus adustus*, *P. hirsutus*, *P. pargamensis*, *P. tulipiferus*, *P. versicolor*, and *Schizophyllum commune*; further research may reveal others, but these were the common ones found.

Fusarium disease of prickly pear, C. W. CARPENTER. (Hawaii. Sugar Planters' Expt. Sta.). (*Cactus and Succulent Jour., 17 (1945), No. 12, p. 169*).—Promising results in pricklypear eradication are briefly noted.

ECONOMIC ZOOLOGY—ENTOMOLOGY

Geographic distribution of Texas wildlife, W. P. TAYLOR. (Tex. A. and M. Col. et al.). (*Tex. Geog. Mag., 9 (1945), No. 1, pp. 1-12, illus. 7*).—The author discusses the diversity of Texas habitats, geography in relation to species, some geographic relations of Texas wildlife, ecologic types as indicated by mammals (including lists of mammals generally distributed in the State or in three or more of its main divisions, principally in west and east Texas, respectively, and those occurring mainly in the plains country, in the Rio Grande plain, and in the Trans-Pecos), geography and vanishing forms of wildlife, and the place of wildlife conservation.

Snares and deadfalls, G. A. PETRIDES. (Ohio State Univ.). (*Jour. Wildlife Mgmt., 10 (1946), No. 3, pp. 234-238, illus. 34*).—In some wildlife studies that involve trapping, snares and deadfalls may provide ways of taking specimens with less damage to the skins and with more food in the digestive tracts than by the slower killing steel traps. Furthermore, the materials for construction are found in the field or are easily carried. This paper describes the preparation and use of such devices, some of which are illustrated.

Breeding birds of the beech-maple-hemlock community, S. C. KENDEIGH. (Univ. Ill.). (*Ecology, 27 (1946), No. 3, pp. 226-245, illus. 3*).—Five biotic communities on the Helderberg Plateau adjacent to the Catskill Mountains of New

York are important in the analysis of bird distribution in ponds and marshes, grassy fields, mixed shrubs and small trees, hemlock-beech forest, and beech-maple-hemlock forest. The bird constituents of each are listed, and the sizes of the breeding populations in the last three were measured and are presented in tabular form. Differences in species composition and size of the bird population are noted for each type of forest. Comparison of the bird fauna of the mixed forests in this area with the deciduous forest biome to the south and the evergreen forest biome to the north indicates that it derives practically all of its members from these biomes. The biome and life-zone concepts—as far as they apply to this region—may be harmonized if the Canadian life zone and the evergreen forest biome are considered equivalent, the Carolinian faunal area of the upper austral life zone and the deciduous forest biome synonymous, and the Alleghanian faunal area of the transition life zone an ecotone or mixture and intermingling of the first two. There are 30 references.

Helminth parasites of birds and mammals in western Massachusetts, J. S. RANKIN, JR. (Univ. Conn.). (*Amer. Midland Nat.*, 35 (1946), No. 3, pp. 756–768).—Examinations of 9 species of birds (49 specimens) and 14 of mammals (122 specimens) revealed the presence of 40 species of helminths—17 nematodes, 13 cestodes, 8 trematodes, and 2 acanthocephalans; most of the distribution records appeared to be new. Many of the parasites found may prove important economically as seen by actual damage to surrounding tissues. There are 39 references.

Collection and preservation of insects, P. W. OMAN and A. D. CUSHMAN. (*U. S. Dept. Agr., Misc. Pub. 601* (1946), pp. 42+, illus. 42).—"Well-preserved and properly labeled specimens are essential to the identification of insects. This publication gives information on collecting, preserving, handling, mounting, and labeling insect specimens, on subsequent care of collections, and on recognition of the general insect groups or orders. It has been prepared in response to numerous requests from farmers, students, servicemen, and other individuals and groups interested in obtaining first-hand knowledge of insects by collecting them."

The insect community found on a perennial peppergrass in southern New Mexico and southwestern Texas, V. E. ROMNEY. (U. S. D. A.). (*Ecology*, 27 (1946), No. 3, pp. 258–262, illus. 3).—The insect community on a perennial peppergrass (*Lepidium alyssoides*) was studied from samples obtained by both cylinder and net methods at eight stations during December 1929–October 1931. The plant stands extended over an estimated 8,000 sq. miles. With the catch by the cylinder method as a basis, it was apparent that the sweep net adequately sampled some insects, but either over- or underestimated the abundance of others. The position of the insect on the plant or on the ground beneath it influenced greatly its catch by the net. Several economically important insects were found to breed on the plant in early spring and on maturing to become dispersed over agricultural crop and other host areas. Among these insects were the beet leafhopper, cowpea aphid, green peach aphid, false chinch bug, a flea beetle (*Phyllotreta albionica* (Lec.)), the diamondback moth, and a plant bug (*Lygus elisus* Van D.).

New species of Florida Mayflies (Ephemeroptera), L. BERNER. (Univ. Fla.). (*Fla. Ent.*, 28 (1946), No. 4, pp. 60–82, illus. 20).

Additions to the Thysanoptera from the Island of Hawaii, F. A. BIANCHI. (Hawaii. Sugar Planters' Expt. Sta.). (*Hawaii. Ent. Soc. Proc.*, 12 (1946), No. 3, pp. 503–514, illus. 9).—This contribution adds 25 species of thrips to the 29 previously known; 3 are described as new.

Conocephalothrips tricolor [n. gen. and sp.], a new urothripid from Hawaii, F. A. BIANCHI. (Hawaii Sugar Planters' Expt. Sta.). (*Hawaii. Ent. Soc. Proc.*, 12 (1946), No. 3, pp. 499-502, illus. 1).

The identity and host plants of blossom midge in Hawaii (Diptera: Cecidomyiidae: *Contarinia*), D. D. JENSEN. (Hawaii Expt. Sta.). (*Hawaii. Ent. Soc. Proc.*, 12 (1946), No. 3, pp. 525-534).—It is concluded from the experiments reported that the gall midge *Contarinia maculipennis* Felt, which infests hibiscus in Hawaii, is the same species which breeds in tomato flowers and has been known in Hawaii under the names *C. solani* (Rübsaamen) and *C. lycopersici* Felt. Adults reared from hibiscus and *Jasminum sambac* were shown to breed on tomato, where their life cycle was indistinguishable from that of specimens reared on tomato. The biological evidence reported and a comparison of specimens from Hawaii with *C. lycopersici* from the British West Indies indicate that the former is probably the same species. In the West Indies, however, *C. lycopersici* has been recorded only from tomato, whereas the Hawaiian form is now known to breed in several unrelated plants. This renders it inadvisable at present to relegate the name *C. maculipennis* to synonymy. In Hawaii this midge has been reared from three species each of *Lycopersicon* and *Solanum*, as well as from *Capsicum frutescens*, *Brassica chinensis*, *Momordica charantia*, *Hibiscus*, and *J. sambac*. This wide host range in Hawaii—involving five plant families—is believed unique among the cecidomyiid gall midges. Only one other species has been recorded from plants of more than one plant family; in that case only two families were involved. There are 14 references.

Some aphid host records, G. F. KNOWLTON. (Utah State Agr. Col.) (*Pan-Pacific Ent.*, 22 (1946), No. 2, pp. 75-76).—An annotated list.

Biology and control of the ash lace bug *Leptocypha minor*, R. L. USINGER. (Univ. Calif.). (*Jour. Econ. Ent.*, 39 (1946), No. 3, pp. 286-289, illus. 2).—*L. minor* McAtee differs from other tingid pests in that it is brown, compact in body form, and without lacy lobes. Adults hibernate in and around the trees. Eggs are laid on the lower sides of leaves in April, after which generations follow one another until October, the population building up to injurious numbers in late summer. The nymphs are flattened, living in colonies on the lower sides of leaves; they pass through five stages, leaving their cast skins adhering to the leaf long after they have gone. They cause a whitening of the leaves and black spotting of the lower surfaces due to fecal deposits. Both nymphs and adults were completely controlled by a 1-800 rotenone-oil mixture; 12 to 20 gal. of spray should be used, depending on the size of the tree. Good coverage—especially of the under surfaces of the leaves—is essential.

The long-horned beetles of Ohio (Coleoptera: Cerambycidae), J. N. KNULL. (Ohio State Univ.). (*Ohio Biol. Survey Bul.* 39 (1946), pp. 133-357+, illus. 139).—The object of this contribution is to aid students in identifying the cerambycid beetles occurring in Ohio. Species for which the author had no records but which were deemed likely to occur in the State are also included. Published keys are used or altered to fit Ohio forms, and some new keys are added. References are included for papers which will aid in identification or which contain phases of biology and economic importance.

A preliminary key to the species of *Pleocomma* (Coleoptera: Scarabaeidae), E. G. LINSLEY. (Univ. Calif.). (*Pan-Pacific Ent.*, 22 (1946), No. 2, pp. 61-65).

A new *Apanteles* from Hawaii (Hymenoptera: Braconidae), C. F. W. MUESEBECK. (U. S. D. A.). (*Hawaii. Ent. Soc. Proc.*, 12 (1946), No. 3, pp. 615-616).—*A. trifasciatus* n. sp., reared from cotton bolls, is described.

Sprayers for dispensing concentrated insecticides, H. O. SCHROEDER and A. W. LINDQUIST. (U. S. D. A.). (*Soap and Sanit. Chem.*, 22 (1946), No. 6, pp.

149-151, 173, *illus. 3*).—The liquefied-gas aerosol has given an entirely new concept of insecticide dispersion; development of the concentrated spray to a practical point brought up the problem of designing equipment that would render possible a wide application of the spray's advantages. Because properly atomized concentrated sprays are highly effective, many thousands of cubic feet of space can be disinfested with midget sprayers designed to contain small amounts of liquid. The sprayer developed and here described is a portable model which can be carried conveniently in a pocket. It consists essentially of a cylindrical liquid tank with a leather compression cup fitted to one end; a compression cylinder closed at one end and slightly larger than the liquid tank slides back and forth over it to provide air pressure with each forward stroke. Detailed descriptions of the parts are given.

New insecticides, R. F. HOLLAND. (Cornell Univ.). (*N. Y. State Assoc. Milk Sanit., Ann. Conf.*, 22 (1945), pp. 165-176).—A brief presentation of present knowledge concerning DDT, benzene hexachloride (666 or Gammexane), Rhothane D₂ or DDD, the aerosol bomb, and methyl bromide. Procedures are given for a successful fumigation "in any plant."

Insecticidal properties of the indigobush (*Amorpha fruticosa*), C. H. BRETT. (Okla. Expt. Sta.). (*Jour. Agr. Res. [U. S.]*, 73 (1946), No. 3, pp. 81-96, *illus. 5*).—A new insecticidal plant has been found in *A. fruticosa*, studies of which were originally started because a color reaction indicative of the rotenoid group had been obtained from extracts of the seeds, stems, roots, and leaves. No rotenone was isolated, but a glycoside reacting to the rotenoid tests was discovered by the U. S. D. A. Bureau of Entomology and Plant Quarantine. The toxic principle has not yet been determined, but the term "amorpha" is used to designate it. Most of the amorpha occurs in resinous pustules on the pods; their size and abundance vary greatly. Seeds from individually identified plants have been analyzed biologically as a guide to selection or breeding of plants for high yields of amorpha. A few insects commonly inhabiting the indigobush have been identified and briefly studied. The bruchid *Acanthoscelides floridae* (Horn) was found to feed on seeds sufficiently to be considered a serious pest; it is parasitized by certain wasps. Laboratory and field tests with amorpha in dust and spray forms on 29 species of insects or mites show that it acts both as a stomach and a contact poison. Amorpha extracts thus far obtained have not included any highly toxic material; however, they have proved effective in controlling a few insects. One of the most interesting characteristics of the extract is its repellency, which persists for over 12 hr. Little is known on the toxicity of amorpha to mammals; apparently, however, it would be poisonous if taken internally. No effect on the skin has been observed.

A toxicological comparison of *Derris* and *Lonchocarpus*, M. A. JONES, W. A. GERSDORFF, and E. R. MCGOVAN. (P. R. Fed. Expt. Sta. and U. S. D. A.). (*Jour. Econ. Ent.*, 39 (1946), No. 3, pp. 281-283).—On the assumption that the samples tested were more or less representative of the species and varieties considered in this study and that the toxicity to houseflies is a fair measure of the toxicological value of a sample, it seems that—other factors such as root yield being equal—the Sarawak Creeping or the high-rotenone Changi No. 3 varieties of *Derris* would be the best choice for producing insecticidal material. From comparisons of chemical criteria with toxicological values it appeared that the colorimetric determination of rotenone plus rotenoids gave the best chemical estimate of the toxicity of the samples, though it varied considerably from the biological assay.

Effect of mineral composition and particle size in dispersants on toxicity of rotenone dusts, H. F. WILSON and M. L. JACKSON. (Wis. Expt. Sta.).

(*Jour. Econ. Ent.*, 39 (1946), No. 3, pp. 290-295).—The presence of small particles—particularly of colloidal range—had a hindering effect on the toxic values of rotenone dusts. When the average particle size of a dispersant was too large (60-mesh) the toxic efficiency of the dusts was less than with intermediate sizes (200- to 325-mesh); if the majority of the particles were very small (1μ to 10μ), the efficiency was greatly reduced. The colloidal particles found in many dispersants tended to cover the cube and derris particles so that they failed to come into contact with an insect. The main sources of colloidal particles in dispersants are free ferrous and ferric oxides and chloritoid minerals (especially those high in ferrous iron) which are easily fractured to small particle size. Pure quartz proved to be the best available dispersant for rotenone but is undesirable because of its high abrasive qualities. Pyrax (pyrophyllite, quartz, and mica) was found to be an excellent dispersant; being comparatively free of ferrous and ferric iron, it contains few colloidal particles. This material is high in quartz—giving it the properties of quartz—but with less of the abrasiveness at the cleavage planes than pure quartz on account of the lubricating qualities of the pyrophyllite cleavage planes. Talc is also a good dispersant when few colloidal particles are present, but if ferrous or ferric iron occurs in marked degree, colloidal particles are usually there in sufficient amount to influence the efficiency of rotenone dusts. Iron—either ferrous or ferric—does not cause direct deleterious chemical effects on rotenone.

Insect control with DDT, L. HASEMAN, G. D. JONES, and C. W. WINGO (*Missouri Sta. Cir.* 309 (1946), pp. 7, illus. 2).—This circular presents information on the available forms of DDT and directions for its use in the control of insect pests of livestock, poultry, household, garden, and fruits.

The use of DDT residual sprays in the home, L. S. HENDERSON and H. H. STAGE. (U. S. D. A.). (*Pests*, 14 (1946), No. 6, pp. 16, 18).—A brief summary of the present status of DDT for use in homes, including solutions, emulsions, and suspensions and the precautions in using it as a residual spray.

D. D. T.—its intelligent use this season, R. H. DAGGY. (Minn. Expt. Sta.). (*Minn. Hort.*, 74 (1946), No. 5, pp. 67-69, illus. 1).

Sabadilla and DDT to control the hairy chinch bug, R. S. FILMER and C. L. SMITH. (N. J. Expt. Stas.). (*Jour. Econ. Ent.*, 39 (1946), No. 3, pp. 309-313).—In 1945 tests, 10 percent sabadilla dust and 10 percent DDT dusts applied at the rate of 100 lb. per acre gave over 90 percent reduction in chinch bug populations. DDT also proved satisfactory when applied as a spray and when incorporated with top-dressing applications.

Beet leafhopper selection of bean varieties and its relation to curly top, H. C. HALLOCK. (U. S. D. A., Idaho Expt. Sta., et al.). (*Jour. Econ. Ent.*, 39 (1946), No. 3, pp. 319-325, illus. 1).—In selectivity trials of 20 varieties of garden beans commonly grown in south-central Idaho—using special revolving cages—a significantly higher percentage of leafhoppers chose the garden varieties in preference to the curly top-resistant field variety Red Mexican; Red Valentine, Bountiful, Kentucky Wonder, and Plentiful were the varieties proving most attractive. In greenhouse tests, Plentiful, Bountiful, Longfellow, Asgrow Black, Valentine, Pencil Pod Black Wax, and Sure Crop Black Wax developed significantly more curly top than the remaining 13 varieties when a large number of viruliferous leafhoppers were allowed a choice. All 19 varieties of garden bean exhibited significantly more curly top than either Red Mexican or Great Northern commercial dry beans. The greenhouse findings in general held true under south-central Idaho field conditions. It is concluded that in years of medium leafhopper populations such varieties as Burpee Stringless Greenpod, Idaho Refugee, and Landreth Stringless Greenpod can be grown with

less danger of loss from curly top than the other varieties tried; losses in bean yields can thus be decreased in this area by avoiding use of highly susceptible varieties in years when high leafhopper populations are expected.

Observations on corn borer and corn earworm in 1943, T. H. PARKS. (Ohio State Univ.). (*Ohio Veg. and Potato Growers Assoc. Proc.*, 29 (1944), pp. 62-71).

The cotton aphid, D. ISELY (*Arkansas Sta. Bul.* 462 (1946), pp. 29, *illus.* 3).—The cotton aphid causes serious losses to cotton only after dusting the plants with calcium arsenate for boll weevil control; its control is thus a part of the boll weevil problem. Because of their remarkable reproductive capacity, outbreaks of aphids may build up with great rapidity; under optimum conditions cotton aphids may begin producing young within 4 days after birth. Ordinarily they are held in check by insect enemies, but dusting with calcium arsenate reduces the numbers of such enemies. Other factors also influence the abundance of cotton aphids, though none are as important as dusting. The most favorable temperature for their reproduction is 20° C.; this is not only lower than that of any other important insect pests of cotton but is lower than that of the insect enemies of aphids. For this reason cotton aphids often appear in conspicuous numbers early and late but are never important in midsummer unless cotton is dusted. Cotton plants growing on soils well supplied with nitrogen are more favorable to aphid development; the recent soil improvement practices, through a wider use of legumes, may be expected to make the tendency for aphid outbreaks somewhat greater. The possibility of the development of an aphid outbreak after dusting increases with the number of dust applications. Outbreaks also develop more rapidly when dusting in a region is general. Where spot dusting only is practiced for boll weevil control, the likelihood of aphid injury is relatively small.

A cotton aphid outbreak can be controlled by dusting with calcium arsenate containing 3 percent nicotine. This mixture may be used to control both the cotton aphid and the boll weevil; for the cotton aphid alone, nicotine may be combined with hydrated lime. In some States the inclusion of 2 percent nicotine in alternate applications of calcium arsenate or of 1 percent nicotine in every application is recommended as a precautionary measure against cotton aphid outbreaks. In a limited test, 0.5 percent rotenone combined with calcium arsenate appeared to be effective against the cotton aphid provided it was applied to the underside of the foliage and came in actual contact with the aphids. In 3 years' experiments, dusting sulfur was effective in killing the aphids actually coming into contact with it, but further trials are needed before final recommendations can be made. There are 37 references.

Damage by *Euschistus impictiventris* and *Chlorochroa sayi* to sugar beets grown for seed, O. A. HILLS and K. B. MCKINNEY. (U. S. D. A.). (*Jour. Econ. Ent.*, 39 (1946), No. 3, pp. 335-337, *illus.* 2).—In field-cage trials (1944) to determine the effect of *E. impictiventris* Stål. on the beet seed crop and to compare the damage from this insect with that by the Say stinkbug, both were found to cause a reduction in the viable seed balls produced, as well as in the number of sprouts per viable seed ball. Indications were, however, that the latter has a tendency to cause slightly more damage.

What about the oriental fruit moth in 1946? E. H. WHEELER. (N. Y. State Expt. Sta.). (*Farm Res. [New York State and Cornell Stas.]*, 12 (1946), No. 3, pp. 14-15, *illus.* 3).—The author briefly reviews some of the activities of this insect pest and its enemies as a basis for forecasting the probable damage of the season; early injury in 1946 seemed to be about normal. As to control, until the coming of DDT no insecticidal program has proved practical for New York

State. DDT as a wettable powder can be applied to peach trees at the rate of 1 lb. actual DDT to 100 gal. water; with properly timed applications and thorough coverage, it is claimed that this material will give satisfactory control of the oriental fruit moth. Parasites of this insect, however, are also readily killed, so that improper timing of applications could result in destruction of the parasites and thus in poor moth control, therefore recommendations for the general use of DDT against the oriental fruit moth await further experimentation.

Control of the sex ratio in *Macrocentrus ancylivorus*, C. H. MARTIN and G. L. FINNEY. (Univ. Calif.). (*Jour. Econ. Ent.*, 39 (1946), No. 3, pp. 296-299).—The authors describe a technic for handling this parasite of the oriental fruit moth in the mating room, through which the proportion of females was increased 19 percent by decreasing the light intensity in the mating room—so as to reduce activity and promiscuous mating—and by allowing a 24-hr. emergency period. Population densities within the levels described did not influence sex ratios at the lower light intensities. Superparasitism by supposedly impregnated females increased the proportion of females.

Life history of the European red mite, L. R. CAGLE (*Virginia Sta. Tech. Bul.* 98 (1946), pp. 19, illus. 7).—In life history studies of the European red mite in the insectary at Blacksburg, Va. (1943-44), a technic was developed for confining the mites on a small section of an apple leaf for rearing; a closed celluloid cell was developed for use in obtaining data on the adult phases, and a method is described for getting the winter eggs. The mite overwinters in the egg stage; hatching began when apple buds were beginning to show pink and continued until the petals were falling. The first winter eggs were deposited by females emerging on August 28 in 1944; 9 generations were reared, and some tenth-generation eggs hatched but failed to develop to maturity. Summer eggs were deposited from about May 10 until September 30 in 1943 and from May 4 until September 27 in 1944; the last eggs hatched on October 19 in 1943 and on October 8 in 1944. The incubation period ranged from 5 days at an average temperature of 76.1° F. in 1943 and 75.2° in 1944 to 20 days at 55.8° in 1943. The larval period, both sexes included, was 1 to 7 days, the protonymphal period 1 to 8 days, and the deutonymphal period 1 to 9 days. The minimum time required for development from hatching to adult was 4 days for each sex; the maximum was 19 days for males and 22 for females. The preoviposition period was 1 to 17 days; the average was 2.3 days in 1943 and 2.4 in 1944. The maximum oviposition period was 25 days; the average for 45 females was 12.4 in 1944. The maximum number of eggs deposited by a female was 69; the average for 45 females was 18.8. The length of life of females was 5 to 39 days and average 18.8 days. All mites reared from unfertilized eggs were male. Mites reared from eggs deposited by females that had been exposed to males were 62.8 percent females and 37.2 percent males.

The control of spittle insects in strawberry plantings, F. G. MUNDINGER. (N. Y. State Expt. Sta.) (*Jour. Econ. Ent.*, 39 (1946), No. 3, pp. 299-305, illus. 5).—The economic forms of these insects are said to be represented by only a few species, but one of these, *Philaenus leucophthalmus* L., is often destructive to strawberries though it breeds abundantly on innumerable host plants. In the tests reported upon, 1 percent rotenone dust with or without an oil conditioner and used at the rate of about 50 lb. per acre, or a spray consisting of 5 lb. of derris in 100 gal. of water with a spreader and applied at the rate of 300 gal. per acre, proved equally effective against spittle insects attacking strawberries, each giving high reductions in the populations. A 5 percent DDT dust with an oil conditioner was also very effective, and certain mixtures below this concentration gave definite promise as controls. Under optimum weather conditions and properly timed,

a 0.5 percent rotenone dust with an oil conditioner applied at about 50 lb. per acre gave satisfactory control. Plain hydrated lime applied at 500 lb. per acre under favorable conditions also gave a considerable amount of protection. Most of the dusts containing nicotine sulfate were ineffective; neither were those containing Lethane, DN, pyrethrum, or plain talc promising as used. Rotenone therefore seems specific for this pest and has the added advantage of leaving a light, almost invisible, deposit. The optimum time for treatment is after most of the eggs have hatched but before many of the nymphs have reached the fourth and fifth instars; in these New York State tests it fell between the middle and last of May. In all cases the material should be so applied as to reach all spittle masses.

Dusting blueberries to control the cranberry fruitworm, B. B. FULTON. (N. C. Expt. Sta.) (*Jour. Econ. Ent.*, 39 (1946), No. 3, pp. 306-308.)—The experimental results reported indicate it possible to control the cranberry fruitworm by dusting with cryolite or DDT; further investigation is needed, however, to indicate whether other materials may be substituted or whether dusts will be effective under more normal and more adverse weather conditions.

[**Report on studies of insects and weather as affecting cranberries**], H. J. FRANKLIN. (Mass. Expt. Sta.) (*Cranberries*, 11 (1946), No. 2, pp. 22, 24.)—A brief report (1944-45) on cranberry insects and their control, new insecticides, and winterkilling and frost injury.

Cuban laurel thrips control on Ficus benjamini, D. O. WOLFENBARGER. (Fla. Expt. Sta.) (*Fla. Ent.*, 28 (1946), No. 4, pp. 82-83.)—A severe infestation of the Cuban laurel thrips is reported on a tree at Homestead, Fla. In a comparison of sprays applied by knapsack sprayer, hexachlorocyclohexane gave almost perfect control, followed in order by DDT plus Lethane 60, DDT alone, and nicotine sulfate. No foliage injury was apparent from any of the treatments.

The control of storage insects in corn seed, H. K. PLANK. (P. R. Fed. Expt. Sta.) (*Jour. Econ. Ent.*, 39 (1946), No. 3, pp. 314-319, illus. 1.)—In warm climates corn seed becomes heavily infested by the rice weevil soon after harvest; if then kept under natural conditions it quickly loses its viability because of further attacks by this and other storage pests. In experiments with USDA-34 sweet corn, dipping the newly harvested ears in a freshly prepared water suspension of copper carbonate—with or without wetting agent—failed to prevent either early or late infestation. Mixing the carbonate as a dust with shelled seed (1-448 by weight) a month after harvest—as recommended for smut control—was equally ineffective, though it tended to hasten sprouting; phenothiazine at the same rate was not only ineffective but injured the seed. Phenoxathiin-bentonite kept the infestation lower and for a longer time than any other treatment used except CS₂ fumigation and isolation, but with no significant improvement in germination. Over a 6-mo. period none of these dust treatments of shelled seed gave more satisfactory results than similarly applied hydrated lime 1-40 by weight. Rolling the partly dried seed ears in hydrated lime alone or in lime containing copper carbonate, phenothiazine, or phenoxathiin-bentonite at a time when the grains had separated enough for the dust to penetrate to the cob retarded infestation and prevented serious damage for a month after harvest. The dosages were all adjusted so that the proportion of chemical used would be equivalent to 1-448 by weight of seed after shelling and that of lime to 1-40. During the next 5 mo. of common storage, however, none of these combinations gave significantly better control than hydrated lime alone. From the practical standpoint—all things considered—rolling the partly dried ears in hydrated lime gave the most satisfactory results.

Susceptibility of edible soya products in storage to attack by Tribolium confusum Duv., C. E. MICKEL and J. STANDISH (*Minnesota Sta. Tech. Bul.* 175

(1946), pp. 28+, illus. 9).—These studies indicated that the confused flour beetle is a much less serious pest of soybean flours and grits than of cereal products. All soybean flours and grits may become slightly infested and some damage may occur when the relative humidity in storage is above 50 percent. Full-fat soybean flour is likely to be more heavily infested than other soybean flours or grits. Low-fat-extracted soybean flour and fine grits were most attractive to the females for oviposition; both of these materials were less favorable for development of the insect than full-fat soybean flour. Any soybean flour or grit combined with cereals—either in unfinished form such as pancake flours or in finished form such as baked goods—was more likely to be infested and damaged by this pest than the soybean flours and grits in their original processed form. The rate of larval development was greatly decreased in soybean flours and grits, resulting in a prolonged larval period. Conspicuous increases in the number of larval instars accompanies decreases in the developmental rate.

DDT to control hide beetles, D. D. JENSEN and F. G. HOLDAWAY. (Hawaii Expt. Sta.) (*Jour. Econ. Ent.*, 39 (1946), No. 3, pp. 283–286).—In tests to determine the comparative efficiency of various materials against damage to rabbit hides by larvae and adults of the hide beetles (*Dermestes vulpinus* F. and *D. cadaverinus* F.), DDT proved outstandingly superior. In spray or dust form it provided excellent protection for at least 371 days after a single treatment and proved equally effective on fresh or dried hides. No evidence of feeding was discernible on hides treated with 10 percent DDT dust or with 2, 3, 4, or 5 percent spray and exposed to continual reinfestation by adults and larvae for 357 days; a slight but negligible feeding occurred, however, following treatment with 2, 3, 4, or 5 percent dust. The maximum damage to hides treated with 1 percent dust or spray did not exceed 5 percent of the hide surface. Sprays proved more toxic to adults than dusts at the same concentration. Oviposition was not prevented by the treatments, but was inhibited in direct proportion to the DDT concentration used; sprays were more effective than dusts in preventing oviposition. DDT did not prevent eggs from hatching, but the larvae emerging died before they were able to feed perceptibly. All concentrations of dusts and sprays tried provided complete kills of the first instar larvae.

What to do about polilla, G. N. WOLCOTT (*Puerto Rico Univ. Sta. Bul.* 68 (1946), pp. 29+, illus. 4).—Damage by the “polilla de madera”—the West Indian dry-wood termite *Cryptotermes brevis* (Walker)—to wooden houses and trim, floors and ceilings of concrete houses, and to furniture, books, and clothing in Puerto Rico rank it with the most injurious insects of the island. New colonies are formed by a pair of adults, after they have broken off their transparent iridescent wings, seeking shelter in books or piles of papers, in drawers and on the underside and in the hidden parts of furniture, and under the caning or wicker or in the bottom of the rockers of chairs. Infestations can be prevented by purchasing furniture made entirely of woods which the polilla does not like to eat, such as West Indian mahogany or some of the other native hardwoods of Puerto Rico, or many of those of tropical America. No furniture is more resistant to attack than the most susceptible piece of wood used in its construction—and practically all the furniture woods of the Temperate Zone are very susceptible.

The most susceptible wood can be made immune to attack if every exposed surface is treated with a dilute solution of CuSO_4 or ZnCl_2 in water, or of 5 percent pentachlorophenol in organic solvents. An ounce of CuSO_4 or ZnCl_2 to 1 gal. of water is double the strength needed, but increasing the amount does not protect untreated surfaces or make up for carelessness in application. To kill termites in infested furniture, the wood surrounding them may be poisoned by injecting into their tunnels a 0.3 percent solution of arsenic as 1.25 gm. of sodium arsenite in

100 cc. of water; or pentachlorophenol may be used to kill by suffocation. In infested wooden houses, use of sugarcane bagasse wallboard impregnated with arsenic by the manufacturer is recommended when repairs are to be made; the bagasse is more attractive to the termites than the wood, and they eat it by preference and die.

A small, dark-colored new *Kaloterms* from Guatemala, T. E. SNYDER (U. S. D. A.). (*Ent. Soc. Wash. Proc.*, 48 (1946), No. 6, pp. 158-160).—Specimens of the nonsubterranean termite *K. nigrinus* n. sp.—here described—were intercepted at San Francisco in a log from Guatemala.

An international termite exposure test—fifteenth progress report, G. M. HUNT and T. E. SNYDER (U. S. D. A.). (*Pests*, 14 (1946), No. 6, pp. 20-30).—This is the fifteenth (E. S. R., 88, p. 787) of a series of annual progress reports comparing the effectiveness of various preservatives in protecting wood from decay and termites in various parts of the world; the data are presented in tabular form. "These tests must continue for many years and be supplemented by actual use experience on a commercial scale before the respective preservatives can be evaluated fully. In the meantime, the use of the partial results for commercial promotion can be very misleading."

House ants, E. A. BACK (U. S. Dept. Agr. Leaflet 147, rev. (1946), pp. 8, illus. 5).—A revision (E. S. R., 78, p. 660).

Cattle lice, their biology and control, J. G. MATTHYSSE ([New York] Cornell Sta. Bul. 832 (1946), pp. 67, illus. 45).—Every winter cattle lice are serious pests in many dairy and beef herds in the northern United States; nevertheless, there has been almost no detailed work on these insects under these conditions. The present study was undertaken to find the best methods for controlling these pests under northern dairy conditions, including work on the biologies of all five species of cattle lice recorded as parasitizing domestic cattle to gain information of possible use in relation to control and investigations of the relative efficiencies, concentrations, and methods of application of various insecticides for louse eradication. The investigation involved the distribution of cattle lice in New York State, seasonal variations in their populations, variations in the resistance of host breeds, the economic effects of infestations, the life histories and biologies of cattle lice (*Linognathus vituli* (L.), *Solenopotes capillatus* Enderlein, *Haematopinus tuberculatus* (Bermeister), the short-nosed cattle louse, and the cattle biting louse), methods by which the lice are transmitted, and their control. The illustrations include four colored plates.

The general conclusions from the two-season control experiments here reported for New York conditions and from work by others (over five pages of references) are as follows: Dusts proved best for use in New York State, those containing 10 percent or more of derris or cube (0.5 percent or more actual rotenone) controlling all species. Finely ground sabadilla can be used as an effective substitute for rotenone. Nicotine was ineffective. Lethane 60, Lethane B71, Thanite, Velsicol, Phenothioxin, Dow K 1875, and pyrethrum have considerable toxicity to cattle lice but apparently cannot be relied upon for complete control; Thanite and Lethane B71 appeared more toxic than Lethane 60 to cattle lice. A combination of Lethane B71 and nicotine, as well as some samples of yam bean, seemed to have promise for controlling all species of cattle lice, but more work is necessary before definite conclusions can be drawn for these insecticides. Hellebore was low in toxicity to cattle lice.

The cattle biting louse can be controlled by heavy application of almost any finely divided dry material; wettable sulfur, diatomaceous earth, and sodium fluoride were all effective. There is disagreement in the literature on the effectiveness of sodium fluoride against sucking lice. Since eight workers have stated that it is ineffective, it must be concluded that this material cannot be relied

upon to control all species of cattle lice. DDT was fairly high in toxicity but did not appear as effective as rotenone or sabadilla in dusts; again further work is necessary before definite conclusions can be drawn. Cattle fly sprays cannot be relied upon against lice. Neither does the aerosol principle seem promising as a method of application. Spot dusting to evaluate louse powders was inaccurate, mainly because lice migrate too rapidly into dusted areas; also, this method gives no indication of the residual action of the insecticides involved.

The species of cattle lice vary greatly in susceptibility to different insecticides; nevertheless it can be said in general that *S. capillatus* is the most resistant species, although very susceptible to nicotine. The short-nosed cattle louse is the next most difficult to control. *L. vituli* is apparently the easiest of the sucking lice to control. The cattle biting louse is in general the most susceptible to insecticides—and even to inert diluents; a laboratory method for evaluating the toxicity of insecticides to it has been worked out which proved useful for evaluating quickly and accurately the toxicity of a series of materials—or various samples of the same material—to this one species.

Observations on tick repellents, C. N. SMITH and H. K. GOUCK. (U. S. D. A.) (*Jour. Econ. Ent.*, 39 (1946), No. 3, pp. 374–378).—In tests at Savannah, Ga., under controlled conditions a moderately high degree of protection from the lone star tick was obtained with Indalone and dimethyl phthalate. Benzyl benzoate, bisoethylxanthogen, and pyrethrum were also of some value as repellents. In a field test at Camp Bullis, Tex., with troops exposed to light infestations of ticks, Indalone, dimethyl phthalate, and a rotenone-sulfur dust reduced the tick attachments. When used in the field by troops exposed to heavy tick infestations, both dimethyl phthalate and 6-2-2 (dimethyl phthalate 6, Indalone 2, and Rutgers 612, 2 parts by volume) gave substantial reductions in tick attachments when applied to the margins of the clothing. Reductions were greater when the clothing was treated after 3 than after 5 days. Reductions were slightly greater when the entire garments were sprayed than when the margins only were treated from a bottle.

DDT to control insect pests affecting livestock, W. G. BRUCE and E. B. BRAKESLEE. (U. S. D. A.). (*Jour. Econ. Ent.*, 39 (1946), No. 3, pp. 367–374, illus. 1).—This work in the southeastern United States during 1944–45 began with preliminary tests on about 3,000 head of livestock in 14 dairy barns. A serious outbreak of stableflies in central Florida was brought under control by passing the animals through a wading vat containing a 2 percent DDT emulsion and spraying their backs with the same material. In tests in South Carolina and Florida two applications of 2.5 percent DDT emulsion sprayed on cattle kept horn flies well below nuisance numbers for the rest of the season. Dipping the animals in a 0.2 percent emulsion was less effective than spraying them with a 2 percent emulsion. One application of a spray containing 2.5 percent DDT—emulsion or water suspension—to the interior of dairy buildings controlled houseflies for the season where the interior was painted and ceiled and where good fly sanitation was practiced.

In large-scale tests (1945) about 26,000 head of livestock and 120 dairy barns were treated with water suspensions of various strengths prepared from water-dispersible DDT powder. Dipping the cattle in a 0.23 percent suspension completely controlled horn flies for 10 to 14 days, but there was no apparent effect on other pests except possibly cattle lice. Complete horn fly control was obtained for 2 to 3 weeks by spraying with a 0.5 percent suspension; this was also somewhat effective against fresh-water mosquitoes and for a month against houseflies in barns. A 1 percent suspension as a spray controlled all insects to about the same extent as half that concentration. A 2.3 percent suspension completely controlled horn flies for 4 to 7 weeks, was very effective against houseflies for

over 3 mo. when sprayed on barns, and was effective for more than 3 weeks against houseflies in hogpens; this suspension was also very effective against stableflies when applied to livestock and to resting places of the flies. It completely controlled fresh-water mosquitoes when applied as a spray to livestock and buildings and was effective against cockroaches in barns; it also appeared satisfactory for controlling cattle lice if the animals were thoroughly sprayed; furthermore, the screwworm fly population was reduced, and the Gulf Coast tick was controlled by it. No apparent injury to any of the animals was observed. It is estimated that the DDT sprays were responsible for a minimum gain of 700,000 lb. of beef and 30,000 gal. of milk during the month following these applications.

Use of new insecticides in dairy plants, E. H. FISHER. (Univ. Wis.). (*Natl. Butter and Cheese Jour.*, 37 (1946), No. 7, pp. 50-58).—An address.

DDT spells death to flies in dairy barns, H. H. SCHWARDT. ([N. Y.] Cornell Expt. Sta.) (*Farm Res. [New York State and Cornell Stas.]*, 12 (1946), No. 3, pp. 1-2, illus. 1).—Large-scale tests are said to show that DDT sprays are effective, safe, and practical for killing flies in dairy barns. Only two applications yearly were found necessary to control flies under New York State conditions.

DDT to control insects affecting man, E. F. KNIPLING. (U. S. D. A.). (*Jour. Econ. Ent.*, 39 (1946), No. 3, pp. 360-366).—Within the past 3 yr. DDT has become one of the most effective agents known against certain insects affecting man, including mosquitoes, lice, flies, fleas, and bedbugs; its importance for controlling diseases transmitted by these insects has also been demonstrated. The data drawn upon for this paper were obtained largely in connection with studies conducted at Orlando, Fla., where investigations on the control of insects and arachnids of importance to the armed forces have been under way since 1942. An attempt is here made to summarize present knowledge on the use of DDT against the more important insects affecting man, with particular emphasis on how the insecticide can be employed in practical operations and the type of formulations that have been found useful. There are 27 references.

Aerosol toxicity: Effect of the nonvolatile content of a DDT aerosol on mortality of houseflies, J. H. FALES, E. R. MCGOVAN, and L. D. GOODHUE. (U. S. D. A.). (*Soap and Sanit. Chem.*, 22 (1946), No. 6, pp. 157-158, illus. 2).—Tests in a Peet-Grady chamber indicated that a DDT-dibutyl phthalate (1-14)-Freon aerosol will give the highest kill of houseflies when the nonvolatile content is about 15 percent. The particle-size distribution curves are given for 10, 15, 20, and 30 percent of nonvolatile material; the most toxic aerosol had 50 percent of its volume in drops below 3μ in radius and the remainder in drops of 3μ to 20μ ; aerosols finer or coarser than these limits proved less toxic.

A re-emphasis on strong colonies and forces of honeybees, D. O. WOLFENBARGER. (Del. Expt. Sta.). (*Gleanings Bee Cult.*, 74 (1946), No. 6, pp. 327-329, illus. 5).—A review, with five literature references.

Some State apiarists are opposed to sulfa drug treatment, L. HASEMAN. (Univ. Mo.). (*Amer. Bee Jour.*, 86 (1946), No. 7, pp. 276-277).—The author reviews briefly some of the more urgent objections to the sulfa-drug treatment of American foulbrood raised by State apiarists at the St. Louis conference, March 26, 1946, and refers to the 30 years' work at the Missouri Station culminating in the publication previously noted (E. S. R., 92, p. 819).

ANIMAL PRODUCTION

Effect of temperature and length of storage on ensilage made from cooked white potatoes, I. LINDAHL, R. E. DAVIS, and N. R. ELLIS. (U. S. D. A.). (*Jour. Anim. Sci.*, 5 (1946), No. 3, pp. 279-284).—This study was undertaken to

determine the best method of adaptation to American conditions of the considerable amount of European work on the ensiling of cooked potatoes, and particularly the effect of temperature and the chemical changes during the fermentation process and the storage period. Experimental silos of various types were employed, with storage at low (35° F.), medium (63°), and high (85°) temperatures from 2 weeks to 1 yr.

As indicated, especially by the pH and starch values, temperature had a decided influence on the rate of fermentation and the final composition of the silage. At 85° most of the fermentation took place during the first 2 weeks, while changes at 63° occurred up to 6 mo., and at 35° there was putrefaction but no noticeable fermentation within a year. The loss of nutrients was significantly greater at high than at medium temperatures, and 60° during the fermentation is suggested. The losses at the end of 6 weeks for the silage stored in trenches were 20.93 percent for dry matter and 48.37 percent for carbohydrates. In a feeding test of 15 days this silage was consumed very readily by six pigs averaging 53 lb. in weight with a gain of 1.6 lb. per day and a food consumption per pound of gain of 4.24 lb. silage, 0.74 lb. corn, 0.3 lb. protein mixture, and 0.014 lb. minerals.

Fused tricalcium phosphate fertilizer: Possible animal feed supplement, I. E. WILLIAMS, F. L. MACLEON, E. MORRELL, and F. P. JONES. (Tenn. Expt. Sta.) (*Indus. and Engin. Chem.*, 38 (1946), No. 6, pp. 651-654).—The experiments described in this paper were designed to test the suitability of fused tricalcium phosphate fertilizer as a mineral feed supplement for animals. This is a product containing 0.4 percent fluorine, and is prepared by a thermal process by which the fluorapatite of the raw rock is decomposed and 85 percent or more of the component fluorine is expelled. The tests consider the physiological availability of the phosphorus and the toxicity of the unremoved fluorine.

The feeding tests described in preliminary reports (E. S. R., 93, p. 224) indicated that when fused tricalcium phosphate of no more than 0.3 percent fluorine content was fed to the animals over a 90-day period as 1 percent of their diet, to provide a total phosphorus level of 0.2 percent, they showed normal growth and phosphorus retention. Reproduction trials now show that the fused phosphate, fed in a diet with total phosphorus level of 0.4 percent, was 75 to 93 percent as effective as a standard material of established phosphorus-feeding value.

Zinc toxicity in rats: Antagonistic effects of copper and liver, S. E. SMITH and E. J. LARSON. (U. S. D. A.). (*Jour. Biol. Chem.*, 163 (1946), No. 1, pp. 29-38, illus. 1).—The feeding of zinc (0.7 percent of the diet as carbonate) to young rats induced a microcytic and hypochromic anemia and subnormal growth. The additional feeding of copper (0.2 mg. daily, as the sulfate) maintained the hemoglobin at significantly higher levels and a mixture of iron (0.2 mg. daily, as ferric pyrophosphate), copper, and cobalt (0.2 mg. daily, as cobaltous chloride) essentially maintained hemoglobin at normal levels, although iron or cobalt supplements alone had no effect. Iron, copper, and cobalt had no effect on the subnormal growth of zinc-fed rats, but supplements of a liver extract produced a highly significant growth response. The liver activity was apparently not due to pantothenic acid.

"Studies such as this point to the possible occurrence of relative deficiencies in addition to absolute deficiencies in the field; that is, animals may be deficient in one mineral relative to an excess of some other."

Methods for identifying feeds and measuring their rate of passage through the rumen of cattle, W. BURROUGHS, P. GERLAUGH, E. A. SILVER, and A. F. SCHALK. (Ohio Expt. Sta.). (*Jour. Anim. Sci.*, 5 (1946), No. 3, pp. 272-278, illus. 1).—Two methods are presented for identifying individual feeds within the rumen of two steers with rumen fistulae while feeding a mixed ration containing

corn, hay, and protein supplement. A chemical method of identification was based upon mathematical treatment of the principal nutrients contained in the feeds fed and the nutrients present in the rumen ingesta. This method was checked, in part, by physically separating out the corn contained in representative samples of rumen contents. The general agreement in results obtained by the two methods was suggestive of their over-all accuracy.

Rations for fattening beef cattle in Montana, R. T. CLARK, E. R. MCCALL, and R. R. WOODWARD (*Montana Sta. Cir.* 184 (1946), pp. 8).—Feeding trials with grade Hereford steers for periods of 183 to 252 days as required to bring the steers to an average weight of 800 lb. or more at the time of marketing are reported. The rations tested consisted largely of home-grown feeds and dried molasses beet pulp.

A ration of one-half each of dried molasses beet pulp and ground barley fed with alfalfa produced greater gains, more finish, and a higher net return per steer than a ration containing three-fourths barley and one-fourth dried molasses beet pulp plus alfalfa hay. A ration of 45 percent each of ground barley and dried molasses beet pulp, 10 percent linseed cake, and alfalfa produced greater gains but slightly lower net returns per steer than a similar ration without linseed cake.

Wheat and dried molasses beet pulp fed in equal amounts, plus alfalfa hay, proved to be quite comparable to barley, dried molasses beet pulp, and linseed cake, plus alfalfa hay, in net return and feed costs per hundredweight gain. However, the latter ration resulted in slightly heavier average daily gains. A ration containing 50 percent wheat, 30 percent barley, 20 percent oats, and alfalfa hay produced lower gains at a higher cost than did a ration of wheat, dried molasses beet pulp, and alfalfa hay.

Dried molasses beet pulp when fed in combination with barley and alfalfa hay seemed to reduce the incidence of bloat but did not entirely eliminate it. Steer calves, weaned the latter part of October and put on concentrate feed, suffered most trouble from bloat during the month of December or before they received a large amount of concentrates.

On the basis of the results presented, two rations with alfalfa hay are recommended for fattening steer calves. One of these consists of ground barley, dried molasses beet pulp, and linseed cake 45 : 45 : 10. The other consists of ground wheat and dried molasses beet pulp 50 : 50.

The relation of certain objective measurements to weights of beef cattle, J. J. WANDERSTOCK and G. W. SALISBURY. (Cornell Univ.). (*Jour. Anim. Sci.*, 5 (1946), No. 3, pp. 264-271, illus. 1).—With a view to developing a practical means of estimating the weight of beef cattle where there is no access to scales, a study was made of the relationship between the heart girth measurement and the body weight of 100 Aberdeen-Angus and 45 Hereford Good-to-Choice fat yearling steers ranging in weight from 640 to 1,150 lb. Also, data were obtained on height at withers, patella or round, and body length for 36 of the Aberdeen-Angus and 30 of the Hereford steers. Heart girth measurements and body weights were also obtained on 27 Aberdeen-Angus heifers and cows of the university herd, ranging in age from 2 to 12 yr.

The coefficients of correlation between heart girth and body weight were 0.91 for the Hereford steers, 0.89 for the Aberdeen-Angus steers, 0.88 for all steers, and 0.93 for the heifers and cows, all highly significant statistically. These coefficients were of a higher magnitude for the lighter steers as compared with the heavier steers, indicating a greater accuracy in predicting the weight of the former. The correlation coefficient for the cows was smaller than that for the heifers, each being smaller than the correlation coefficients for the steers. A

calculation of the regression of the logarithms of actual live weight on the logarithms of heart girth measurements, indicating a straight line relationship, showed that the Aberdeen-Angus steers were lighter than the Hereford steers in relation to their heart girth measurements. The regression line for the heifers and cows indicated that they were heavier than the steers in relation to their heart girth measurements, especially at the larger tape measurements. Regression equations, in logarithms, for predicting weight from heart girth measurements are presented. Calculations of the interrelationships between heart girth, height at withers, patella or round, body length, the Minnesota formula (heart girth $\times$ heart girth $\times$ body length $\div$ 300), and body weight for all of the steers showed that the correlation coefficients were highly significant for every combination except for that between height at withers and patella, which was significant. There was a trend towards greater significance in these relationships for the lighter steers as compared with the heavier steers. The most significant single measure for estimating weight was the heart girth measurement, which was only slightly less significant than the more detailed estimation obtained by using the Minnesota formula.

Variation in determinations of digestive capacity of sheep, E. B. FORBES, R. F. ELLIOTT, R. W. SWIFT, W. H. JAMES, and V. F. SMITH. (Pa. Expt. Sta.). (*Jour. Anim. Sci.*, 5 (1946), No. 3, pp. 298-305).—In this study 22 yearling Merino wethers were used as subjects in a digestion experiment with clover-timothy hay as the only feed. The standard deviations of the values determined for digestibility of the nutrients of the hay were reasonably low except with reference to lignin as determined by difference. A table is presented giving the standard errors and the minimum difference required between determinations with 1 to 10 sheep for odds of significance of 19 to 1. While the number of sheep required per experimental treatment depends on the permissible variability of results, it is concluded that 5 sheep per treatment are a sufficient number for usual purposes if the experimental technic is efficient, and if the sheep have been successfully treated on account of parasites of the alimentary tract.

Palatability for sheep and yield of hay and pasture grasses at Union, Oregon, D. E. RICHARDS and V. B. HAWK. (Coop. U. S. D. A.). (*Oregon Sta. Bul.* 431 (1945), pp. 48+, illus. 10).—Feeding tests with sheep of some of the most promising grasses in the grass nursery at Union, Oreg., were made from 1940 to 1944 to determine their value for grazing and for hay. Three palatability classes were set up for each purpose.

It is concluded that orchard grass, tall oatgrass, and meadow fescue should be used as pasture grasses. Timothy should be used for hay, but better grasses such as smooth brome are available. Until more data are available big bluegrass should be handled for hay. Mountain brome and Canada wild-rye are best adapted for short-ley pastures such as sweetclover grass mixture. Tall wheatgrass, Canada wild-rye, and possibly other tall, coarse grasses made the best hay when harvested before blooming.

If a palatable grass for sheep is desired one of the following should be seeded: Hay grasses—Fairway crested wheat, smooth brome, beardless wheatgrass, big bluegrass, meadow foxtail, and timothy; pasture grasses—smooth brome, orchard grass, meadow foxtail, meadow fescue, tall oatgrass, and Standard crested wheat. Some of the grasses that will produce a good yield of palatable feed are: Hay grasses—tall wheatgrass and Canada wild-rye (each cut before bloom), smooth brome, timothy, and big bluegrass; pasture grasses—tall oatgrass, meadow fescue, pubescent wheatgrass, meadow foxtail, and alta fescue.

Lamb-feeding experiments, J. P. WILLMAN, F. B. MORRISON, and E. W. KLOSTERMAN ([*New York*] *Cornell Sta. Bul.* 834 (1946), pp. 62, illus. 8).—The

experiments reported were conducted under feed-lot conditions, with white-faced western ewe and wether lambs, to obtain information of practical value to the lamb feeder. Many of the experiments have been repeated three to five times.

In a study of the value of various protein concentrates, linseed meal, soybean oil meal, whole soybeans, and corn gluten meal were about equal as supplements. The lambs consumed a higher percentage of the roughage offered and were easier to keep on full feed with linseed meal, and this was slightly superior to distillers' corn dried grains (dark) and brewers' dried grains. The results of one experiment (two comparisons) showed distillers' wheat dried grains to be slightly superior to distillers' corn dried grains (dark). In one test, standard wheat middlings proved to be a palatable feed, but 4 out of 10 wethers developed urinary calculi after having been fed wheat middlings for 94 days.

Satisfactory growth and fattening were obtained when enough linseed meal was fed to provide a ration having a protein content of 10 to 10.5 percent (air-dry basis). Rations containing more than 10.5 percent of protein failed to bring significant improvement, but rations containing less than 10 percent total protein resulted in lower rates of gain and higher feed costs.

Lambs fed urea nitrogen as a substitute for all of the linseed-meal nitrogen were difficult to keep on feed and gave unsatisfactory feed-lot performance. As a substitute for two-thirds of the nitrogen, urea failed to show any improvement over the results obtained from a ration containing the same amount of linseed meal but no urea. The feeding of cane molasses and sodium sulfate did not enhance its utilization. Distillers' corn dried grains had a slightly higher value than brewers' dried grains, but both feeds proved satisfactory when fed as protein supplements to a ration of shelled corn and first-cutting alfalfa hay. Distillers' corn dried grains were slightly the superior grains when fed as a substitute for one-third, by weight, of the shelled corn in the ration. As a substitute for one-half of the shelled corn, they had a much lower value than when fed as a substitute for only one-third of the corn.

Shearing feeder lambs during cold weather increased the cost and decreased the rate of gain. "Such factors as yield of wool, the price received for it, and the prices paid for the lambs will determine whether shearing pelts can be produced at a profit."

Factors affecting rate of gain and their relation to allotment of pigs for feeding trials. R. M. MIRANDA, C. C. CULBERTSON, and J. L. LUSH. (Iowa Expt. Sta.). (*Jour. Anim. Sci.*, 5 (1946), No. 3, pp. 243-250).—The rates of gain by 601 pigs in the Record of Performance work of the Iowa Station were studied to determine the relative importance of breed, litter, sex, initial weight, and previous performance in allotting pigs for feeding trials. It was found that breed and litter must be carefully considered. Differences between sexes were very small although real. "Neglecting sex in the allotment will increase the experimental error only a little, except where carcass characteristics are a prime object of study." The intra-litter correlation between initial weight and rate of gain was 0.24 in these data, indicating that initial weight is not important in allotment when the available pigs do not vary much in weight, and that differences in initial weight might well be handled by analysis of covariance. The intra-litter correlation between gain in a 30-day preliminary period and rate of gain in the final feeding period was 0.32, which is only a little more than was found for initial weight. "The large component of variance for error indicates that, although careful allotment does increase the precision of the experiment, the precision cannot become extreme even by perfect allotment. Further refinements must be sought in the technics of feeding and management if nearly perfect precision is to be attained."

Effect of feeding level on daily gains of pigs, F. B. HEADLEY. (Nev. Expt. Sta. coop. U. S. D. A.). (*Jour. Anim. Sci.*, 5 (1946), No. 3, pp. 251-255, illus. 1).—This study is based on results obtained from feeding experiments conducted with 95 groups of pigs through a period of 20 yr. The period of experimentation with each group was between weaning age and a finishing weight of approximately 200 lb. All groups of pigs received alfalfa in some form, a grain concentrate, and skim milk. They were divided into four classes: (1) Pasture with no extra protein supplement, (2) pasture with extra protein supplement, (3) dry lot with no extra protein supplement, and (4) dry lot with extra protein supplement. The pigs in class 2 made the most rapid gain and those in class 3 the least rapid gain at any given feeding level.

With all groups included, the regression equation was found to be $y = 0.2 + 0.367x$, in which y represents daily gain and x the feeding level. The feeding level was found by dividing the average total digestible nutrients fed per day by the mean live weight. It is concluded that the regression equation may be used (1) to indicate the efficiency of any ration that has been used, and (2) as a means of estimating what the daily gain would be at any feeding level.

Sardine condensed fish solubles and rye pasture for sows during gestation and lactation, J. L. KRIDER, B. W. FAIRBANKS, R. F. VAN POUCKE, D. E. BECKER, and W. E. CARROLL. (Univ. Ill.). (*Jour. Anim. Sci.*, 5 (1946), No. 3, pp. 256-263, illus. 3).—A basal ration composed of ground yellow corn 67, expeller soybean meal 25, dehydrated alfalfa meal 5, fortified cod-liver oil 0.5, and minerals 2.5 percent, and which contained 17 percent crude protein, was nutritionally inadequate for gestation and lactation under dry-lot conditions. Only 26 percent of the pigs, averaging 17.1 lb., were weaned by sows fed this ration. Deficiency symptoms are described. The addition of either 3 or 6 percent of sardine condensed fish solubles (fresh basis) effectively corrected the deficiency (or deficiencies) of the basal ration. Survivals of pigs so fed to weaning time were 92 and 71 percent with average weights of 31.1 and 33.7 lb., respectively. The pigs in both groups were very growthy and thrifty. The fish solubles was apparently providing supplementary nutrients, probably vitaminlike, which were necessary for satisfactory growth, gestation, and lactation. Fall-seeded rye pasture also proved to be an excellent source of the supplementary nutrients required to correct the inadequacies of the basal ration. Gilts receiving rye pasture weaned 74 percent of their pigs with a weaning weight of 31.9 lb. each.

Protein and mineral supplements for pigs fed wheat and barley, R. T. CLARK and R. R. WOODWARD (*Montana Sta. Bul.* 434 (1946), pp. 18).—Experiments are reported in which the efficiency and economy of common protein supplements in wheat and barley rations for swine were tested, as well as the comparative feeding value of locally grown wheat and barley, the value of mineral supplements in swine rations, and the comparative economy of full feeding and limited feeding. The experiments were conducted over a period of 8 yr. with spring pigs both on pasture and in dry lot and with fall pigs in dry lot, and mainly with purebred Duroc Jerseys.

Wheat proved to be superior to barley in promoting rapid gains both in a dry lot and on pasture when these grains were supplemented with a protein feed. Barley was found to be about 93 percent as valuable as wheat. Pigs self-fed wheat and tankage on alfalfa pasture averaged 0.18 lb. more gain per day than pigs fed wheat alone. Skim milk and buttermilk proved to be the most efficient but not necessarily the most economical protein supplements with wheat and barley, both in dry lot and on pasture. "The advisability of using skim milk will in most cases depend on the price ratio between whole milk and cream and the ability of the producer to satisfactorily market whole milk." Soybean oil meal

or flakes as a supplement for pigs fed wheat and barley on pasture produced fair gains, but skim milk and tankage were found superior. A supplemental mixture containing equal parts of tankage, cottonseed oil meal, and linseed oil meal was slightly better than tankage alone but much less efficient than buttermilk in producing rapid and efficient gains. Alfalfa hay alone was unsatisfactory as the only supplement. A basal ration consisting of grain (barley or wheat), tankage, alfalfa, and common salt was not improved by supplementing either with bonemeal, treble superphosphate, lime, or iodine. The addition of bonemeal to a ration of barley and alfalfa for pigs in a dry lot increased significantly the rate and efficiency of gains, but performance of the pigs was unsatisfactory on a ration so low in protein. Comparisons of full-fed with limited-fed rations on pasture over a period of 6 yr. indicated that pigs finish more rapidly but at more expense per unit of gain on full feeding.

Finishing pigs on rations including barley, oats, corn, P. G. BEDENBAUGH (*Miss. Farm Res. [Mississippi Sta.], 9 (1946), No. 4, p. 2*).—In a 64-day test, lots of 9 or 10 pigs were grazed on oat pasture plus tankage and cottonseed meal and various ground grains. Lot 1, receiving corn, made average daily gains per head of 2.28 lb.; lot 2, on corn and Delta oats, 2 lb.; lot 3, on corn and Delta barley, 2.14 lb.; lot 4, on Delta oats and barley, 1.84 lb.; and lot 5, on corn, Delta oats, and Delta barley, 2 lb.

Practical poultry feeding, L. E. CARD (*Ill. Agr. Col. Ext. Cir. 606 (1946), pp. 23, illus. 2*).—This circular assembles data on the kind and sources of the necessary nutrients and planning the rations. Sample formulas for mash mixtures are included.

Vitamins for poultry, F. E. MUSSEHL and C. W. ACKERSON (*Nebraska Sta. Cir. 81 (1946), pp. 8, illus. 3*).—The various vitamins needed by poultry are discussed as to function, probable requirements, sources, and stability, together with starting-mash formulas and specifications for a vitamin concentrate.

The folic acid requirement of chicks for growth, feathering, and hemoglobin formation, E. I. ROBERTSON, L. J. DANIEL, F. A. FARMER, L. C. NORRIS, and G. F. HEUSER.—([N. Y.] Cornell Expt. Sta.). (*Soc. Expt. Biol. and Med. Proc., 62 (1946), No. 2, pp. 97-101, illus. 2*).—The folic acid requirement of chicks for growth, feathering, and hemoglobin formation was determined, using a purified diet containing 2.0 $\mu\text{g.}$ of preformed folic acid per 100 gm. of diet. The total folic acid content of the basal diets as determined microbiologically following incubation with chick liver was 5 $\mu\text{g.}$ pr 100 gm. of diet for experiment 1, and 15 $\mu\text{g.}$ for experiments 2 and 3. The following amounts of folic acid, which include the amount in the basal diet, were required for its several functions: For survival to 6 weeks of age, approximately 25 $\mu\text{g.}$ per 100 gm.; for growth and hemoglobin formation at 4 weeks of age, 45 $\mu\text{g.}$; for growth at 6 weeks, 45 $\mu\text{g.}$, but for hemoglobin formation at 6 weeks, 35 $\mu\text{g.}$; and for feathering at 6 weeks of age, not less than 55 $\mu\text{g.}$ per 100 gm. of diet. In these experiments the addition of succinylsulfathiazole at 1 or 2 percent of the diet did not have any effect on growth, feathering, or hemoglobin formation in chicks to 6 weeks of age.

Effect of diet on the response of chicks to folic acid, T. D. LUCKEY, P. R. MOORE, C. A. ELVEHJEM, and E. B. HART. (Wis. Expt. Sta.). (*Soc. Expt. Biol. and Med. Proc., 62 (1946), No. 2, pp. 307-312, illus. 4*).—Continuing previous work (E. S. R., 95, p. 549), a study of the effects of dietary constituents upon the activity of synthetic folic acid in chick nutrition indicated that no definite requirement for this compound can be established since the response to a given amount of folic acid depends upon the type of ration used. Folic acid produced the least response with high-fat diets or diets containing glucose, sucrose, or starch as the sole carbohydrate, and the best response with diets containing high

protein, low fat, or corn meal and dextrin as the carbohydrates. Hemoglobin responses were better on diets containing dextrin or corn meal than diets containing other carbohydrates. Feather development could not be correlated with either the amount of folic acid in the diet or the rate of growth of the chicks when low levels of folic acid were included in the diet. Whole-liver substance, when added to a diet containing sucrose as the carbohydrate, gave an increased growth response that could not be attributed to its folic-acid content.

The influence of autoclaving soybean-oil meal on the availability of cystine and methionine for the chick, R. J. EVANS and J. MCGINNIS. (Wash. Expt. Sta.). (*Jour. Nutr.*, 51 (1946), No. 4, pp. 449-461).—Using 17 groups of 15 New Hampshire chicks each, in a 4-week experiment, the nutritive value of the proteins of raw soybean-oil meal, as determined by total gain in weight and gain per gram of protein consumed by the chicks, was increased by autoclaving the meal at 100°, 110°, or 120° C. for 30 min. The protein nutritive values were lower when soybean-oil meal was autoclaved at 130° for 30 or 60 min. than when it was autoclaved at 100°–120°. The availability for growing chicks of the methionine and cystine or the organic sulfur in soybean-oil meal was increased by autoclaving the raw meal. The availability of the methionine and cystine or the organic sulfur was not as great when the meals were autoclaved at temperatures above 120° as it was when the meals were autoclaved at 100°, 110°, or 120°. Added methionine increased the growth and feed efficiency on all diets. The addition of 0.2 percent *DL*-methionine to the basal diet increased the retention by the growing chick of the methionine originally in the unsupplemented diet. The methionine of the soybean-oil meals was retained to a much greater extent than the cystine.

Corn-and-cob meal versus ground shelled corn in rations for chickens, D. C. KENNARD and V. D. CHAMBERLIN (*Ohio St. Bimo. Bul.* 241 (1946), pp. 104–113).—Six experiments with growing chickens and five with layers in which corn-and-cob meal was used as a substitute for ground shelled corn are reported.

During the first 8 or 10 weeks, there was little significant difference in mortality, but in general there was a slightly lower rate of growth from the corn-and-cob meal rations. However, the average feed consumption and the pounds of feed per pound of final live weight of birds were favorable to the corn-and-cob meal. Middlings, bran, and ground shelled corn or ground wheat was satisfactorily replaced in one experiment with a high percentage of corn-and-cob meal.

In the experiments with growth of chickens to 18, 20, and 26 weeks, the average gain in weight on the corn-and-cob meal ration was 2.47 lb. and on the shelled corn ration 2.25 lb. The respective pounds of feed per pound of gain were 7.25 and 7.79.

Egg production in the corn-and-cob meal ration averaged 52 percent per bird as compared with 55 percent on the ground shelled corn ration, with feed consumption per dozen eggs averaging 6.62 and 6.30 lb., respectively, and average body weight per bird 5.18 and 5.33 lb. However, a noticeably better condition of plumage was observed among the groups of layers that received the corn-and-cob meal rations, and little or no feather picking and cannibalism was experienced among those groups. It is pointed out that this may often prove of far greater advantage than the disadvantages of slightly less egg production and less body weight of the layers as experienced in these experiments.

A new ration for growing chickens on range and pasturage, D. C. KENNARD and V. D. CHAMBERLIN (*Ohio Sta. Bimo. Bul.* 240 (1946), pp. 57–60, *illus.* 2).—Based upon the previous 5 years' results, experiences, and observations, a new type of ration and method of feeding was designed for raising the station's 2,500 pullets in 1945. The primary object was to avoid the use of needless feed

ingredients and save feed and labor when chickens are raised on range and pasturage. Two rations were devised to supplement a limited range with good pasturage, one supplying 12 percent protein in a whole-grain mixture consisting of whole corn or wheat 60, whole oats 10, coarsely ground corn 15, wheat bran 5, meat scrap 3, soybean oil meal 4, and oystershell or limestone grit, granite or gravel grit, and salt 1 percent each. The other consisted of the same ingredients and amounts, except that 14 percent protein was provided by the use of whole corn or wheat 50, whole oats 10, ground corn 18, wheat bran 6, meat scrap 5, and soybean oil meal 8 percent. The mixture was fed once daily from 3 to 4 p. m. in open-type feeders and in amounts certain to be consumed by about noon of the following day. Practically no difference was noted in the weights of the pullets or feed consumption on the two rations at the end of the 14 weeks' experiment.

Starting and growing rations for turkeys, R. E. ROBERTS (*Indiana Sta. Bul. 517* (1946), pp. 32, illus. 3).—In five trials a starting ration containing 10 percent of dried skim milk and 24.1 percent of protein gave significantly greater increases to 12 weeks of age in only one test for poultts of both sexes and another trial for males than a 5 percent skim milk and 22.8 percent protein content. No differences were noted in the efficiency of the two rations or the mortality. Some of the poultts started on wire floors developed slipped tendons, a need of additional manganese sulfate being suggested.

In seven experiments with turkeys raised in confinement and one on range, all mash rations comparing 23 or 16 percent of protein were fed ad libitum from 12 weeks to 24, 26, or 27 weeks of age. Weights were practically the same at these ages, although greater gains during the early part of the period were made on the higher protein. In the different trials the birds on the 16-percent protein ration consumed approximately 10 to 20 percent less feed than those on the 23-percent protein ration.

Limited data obtained from feeding each ration to one lot of turkeys each on range and in confinement showed that on the 23-percent protein ration the growth on range was practically the same as in confinement, while on the 16-percent ration the males on range were the heavier throughout the growing period, and the females to 24 weeks of age. On both rations the birds on range consumed more feed, exclusive of that supplied by the range, than those in confinement.

In those experiments in which separate feed records were obtained, the females consumed only 64 to 80 percent as much feed as the males. Due to their greater gains, however, the males used only 83 to 92 percent as much feed per pound of gain as the females. There was no difference in mortality which could be attributed to the rations fed.

In two experiments with turkeys raised in complete confinement and one with turkeys on range, two all-mash rations, each containing 16 percent protein, were fed ad libitum from 12 to 27, 28, or 30 weeks. One ration contained 2.5 percent dried skim milk, while in the other the milk was replaced by 2.5 percent soybean oil meal. In no case was there any significant difference in the comparable weights of either sex on the two rations, in the feed efficiency, or in viability.

DAIRY FARMING—DAIRYING

Dairy Research Digest [June and September 1946] (*Dairy Res. Digest* [Louisiana Sta.], 4 (1946), Nos. 2, pp. 4; 3, pp. 4).—In addition to items noted elsewhere in this issue or previously, No. 2 contains Better Dallis Grass Is Selected, by C. R. Owen (p. 3). No. 3 contains Clean Pasture Proved Good for Young Calves, by G. D. Miller and D. M. Seath (p. 1); Heat Tolerance of Jerseys Compared to Holsteins, by D. M. Seath and G. D. Miller (p. 1); Dehydrated Sweet

Potatoes Are Valuable in Dairy Ration, by D. M. Seath, L. L. Rusoff, and G. D. Miller (p. 2); and Johnson Grass Boosts Milk Yields, by D. M. Seath and D. M. Johns (p. 2).

Simple vs. complex grain mixtures in dairy rations, III, IV (*Ohio Sta. Bimo. Buls.* 240 (1946), pp. 64-73; 241 (1946), pp. 97-99).

III. *The effect of substituting ground ear corn for ground shelled corn in the simple grain mixture*, C. F. Monroe and W. E. Krauss.—Continuing this series (E. S. R., 95, p. 381), reversal trials were conducted using 2 periods of 50 days each and 70 Holstein cows. A simple grain mixture containing ground ear corn was compared with one containing ground shelled corn. Both mixtures contained soybean oil meal, 2.5 percent more being added to the ground ear corn mixture in order to equalize the protein content of the two mixtures. Comparable amounts of salt, steamed bonemeal, and limestone were used, together with corn silage and legume mixed hay.

Milk and butterfat production was a little higher on the ground shelled corn mixture; in terms of 4 percent milk, the production on the latter amounting to 98.83, 98.29, and 98.62 percent of the former, in the three trials, respectively. An analysis of the production following the reversing of the feeding at the end of the first period confirmed these findings. There were no marked differences in live-weight gains on the two mixtures, and the butterfat tests were apparently not affected.

It is concluded that the simple grain mixture containing ear corn and reinforced with extra soybean oil meal may be expected to yield results within 2 percent as satisfactory as a comparable mixture containing ground shelled corn, and that the common practice of feeding ground ear corn rather than ground shelled corn to dairy cows is justified.

IV. *Heifer calves raised for replacements and veals for slaughter*, W. E. KRAUSS and C. F. MONROE.—Sixty-five heifer calves were used in a 6 months' comparison and 58 bull calves were raised to slaughtering age at 9 weeks. The calves did as well when fed, in addition to milk, a simple grain mixture containing equal parts by weight of whole shelled corn and whole oats as when a complex mixture containing ground corn, ground oats, bran, linseed oil meal, soybean oil meal, and skim milk powder was fed. The daily gains per head for the simple and complex mixtures were 1.2 and 1.23 lb. for the heifer calves and 0.86 and 0.81 lb. for the bull calves.

"When calves are raised according to the whole milk-skim milk plan, simple combinations of whole or coarsely ground cereal grains should constitute a satisfactory grain mixture."

Wild yellow mustard seed and fanweed seed as concentrate feeds for milking cows, J. O. TRETSVEN and J. A. NELSON (*Montana Sta. Bul.* 435 (1946), pp. 11).—Analysis of a sample of wild mustard seed containing 14 percent of sweetclover and 2.22 percent of other seeds and inert material showed a composition of moisture 8, crude protein 23.37, ether extract 30.17, nitrogen-free extract and ash 27.51, and crude fiber 10.95 percent. For a fanweed seed sample containing 6.11 percent of green foxtail and 4.48 percent of other seeds and inert material, the corresponding analysis was 11.10, 19.29, 24.62, 27.74, and 17.25 percent. In two feeding trials of 56 and 70 days, respectively, with 5 or 6 cows in each lot, there was an average daily production of milk per cow of 45.44 lb. on an 8 percent wild mustard seed ration, 43.70 lb. on an 8 percent fanweed seed ration, and 43.22 lb. on an 8 percent soybean oil meal ration. The corresponding daily yields of butterfat were 1.73, 1.61, and 1.63 lb. In a third trial with 8 cows in each lot and an 84-day period, the average daily production was 26.75 lb. of milk and 1.21 lb. of butterfat on a ration containing 10 percent of ground wild yellow mustard seed, and 24.95 lb. of milk and 1.12

lb. of butterfat for the lot receiving 10 percent additional ground barley in place of the mustard seed. It is concluded that the ground wild yellow mustard seed has a feeding value slightly above that of soybean oil meal and that the ground fanweed seed is of about equal value with the soybean oil meal. Both seeds can be fed immediately after milking without detrimental effect on the flavor of the milk, cream, and butter produced.

Clipping vs. grazing by dairy heifers as means of estimating yield of bluegrass pastures, H. B. MORRISON and F. ELY. (Ky. Expt. Sta.). (*Jour. Dairy Sci.*, 29 (1946), No. 7, pp. 393-405, illus. 6).—Yield of a Kentucky bluegrass pasture of 11.6 acres in terms of total digestible nutrients per acre was calculated from clipping with a lawnmower and from grazing with a total of 116 dairy heifers during 5 seasons, 1940-1944, inclusive, ranging from 168 to 210 days in length. The average calculated yield from clipping was 68.5 percent of that from grazing. The trends of the curves representing calculated yield obtained by clipping and grazing with heifers were in general quite similar, although a pronounced change in yield usually occurred in the grazing curve 2 to 3 weeks later than in the clipping curve. The data obtained indicated that the clipping method of measurement may be used in a preliminary way to evaluate variables in experimental management of Kentucky bluegrass pastures.

The relative importance of high temperature and high humidity as factors influencing respiration rate, body temperature, and pulse rate of dairy cows, D. M. SEATH and G. D. MILLER. (La. Expt. Sta.). (*Jour. Dairy Sci.*, 29 (1946), No. 7, pp. 465-472, illus. 3).—Continuing earlier studies (E. S. R., 95, p. 380), observations were made of 36 Holstein and 16 Jersey milking cows during the summer of 1944 and of 41 Holsteins and 27 Jerseys in 1945.

Changes in air temperature appeared to be the major cause of increases in body temperature and respiration rate of milking cows. Multiple regression equations indicated that 1° increase in air temperature was responsible for from 13 to 15 times as much increase in body temperature as was an increase of 1 percent in humidity. Likewise, 1° change in air temperature caused from 41 to 43 times as much influence on respiration rate as did 1 percent change in humidity. On a partial correlation basis (air temperature held constant) an increase in humidity slightly lowered respiration rate. The r values were -0.06 and -0.02. Partial correlations between air temperature and body temperature (humidity held constant) were 0.674 and 0.534. Pulse rates were less affected by either air temperature or relative humidity than was body temperature. Air temperature and pulse rate measured independently of humidity gave r values of 0.195 and 0.159. Humidity and pulse rate (with air temperature constant) gave a value of -0.05 for one year and 0.07 for the other, thus leaving a question as to its real relationship.

Variations in the live weight of dairy cattle, N. N. ALLEN (*Vermont Sta. Bul.* 534 (1946), pp. 12, illus. 2).—Dairy cattle were confined to stalls mounted on scales for 10-day periods, and weighed at half-hour intervals without disturbing their usual routine. Records were kept of all measurable factors which might contribute to a change of weight and the average trend of the weight during the day and the range of the variations from day to day are shown graphically.

The animals showed very striking uniformity in the times at which the maximum, minimum, and mean weights for the day were reached. The five milking cows drank more frequently and consumed much more water than did five dry cows and heifers. They also eliminated more feces and urine and had greater insensible loss, and their weights fluctuated over a wider range. The nonmilking animals were more active and lay down and got up more frequently.

It is suggested that in any experiments in which live weights are determined, careful thought be given to the purpose for which the weights are to be used. The time of day at which the animals are weighed should be planned accordingly.

Wanted—more long lived cows, E. J. PERRY. (N. J. Expt. Sta.). (*Guernsey Breeders' Jour.*, 69 (1946), No. 2, pp. 131-133).—This is a statement of the advantages of retaining dairy cows in service for relatively long periods.

Time required for making flavor judgments of milk, G. M. TROUT. (Mich. Expt. Sta.). (*Jour. Dairy Sci.*, 29 (1946), No. 7, pp. 415-419, illus. 1).—The average time required to make flavor judgment on 2,262 individual samples of milk was found to be 7.2 sec. per sample, ranging from a low of 2.9 sec. for "salty" milk to 8.2 sec. for "excellent" milk, which invariably required longer judgment time than did off-flavor milk. The judgment times for "cheesy," "high-acid," "rancid," "flat," and "oxidized" milks were between these extremes and were in the above order. Milks having off-flavors of slight intensity required considerably longer judgment time than did those having pronouncedly intense off-flavors.

Raw milk contamination in homogenized milk, A. V. MOORE and G. M. TROUT. (Mich. Expt. Sta.). (*Canad. Dairy and Ice Cream Jour.*, 25 (1946), No. 7, pp. 33-34, 64, illus. 3).—Tests are reported with a high-quality milk pasteurized at 143° F. for 30 min. and homogenized at 2,500 lb. pressure, contaminated with raw mixed milk of good quality. It is concluded that the phosphatase test can detect a 0.5 percent contamination. The level of contamination detectable by organoleptic examination depended largely on the length of the storage period, in general needing at least 4 percent of raw milk with only 24 hours' storage and in no case detecting 0.1 percent when mixtures were held 7 days at 40°.

Heat resistant bacteria from an unclean milking machine invade the udder of the cow, C. S. and H. S. BRYAN and K. MASON. (Mich. Expt. Sta.). (*Milk Plant Mo.*, 35 (1946), No. 8, pp. 30-32).—An instance is cited in which an unclean milking machine contributed heat-resistant bacteria to the milk both directly during the milking process and indirectly by having served to inoculate the cow's udders with these bacteria. The cows rid themselves of the heat resistant bacteria in periods varying from 1 to 4 mo. after the milk equipment was properly cleaned and sanitized. During this same period the standard plate bacteria count of the properly pasteurized milk of this dairy decreased from as much as 2,500,000 to its previously normal level of 10,000 to 25,000.

Quality control of milk for manufacturing purposes, J. C. HENING. (*Milk Plant Mo.*, 35 (1946), No. 6, pp. 28, 48-56, illus. 2).—This is an account of the classes of milk established by the Food and Container Institute for the Armed Forces and of the work of the mobile laboratories in carrying on tests of milks used for manufactured products.

Measuring detergency functions as affected by various detergents and procedures against milk films by application of a mechanical washing apparatus, J. M. JENSEN. (Mich. Expt. Sta.). (*Jour. Dairy Sci.*, 29 (1946), No. 7, pp. 453-463, illus. 6).—Detergency studies were made on various types of washing products by washing raw milk films from glass surfaces by a devised mechanical apparatus and measuring result in terms of light transmission by use of a Cenco-Sheard spectrophotometer. An appreciable difference was observed in detergency as affected by detergent material and variations in washing procedure that was measured by light transmission readings. Highest detergency values were secured with solutions prepared of near-neutral wetting agent and metaphosphate mixtures. Next in order of detergency were slightly alkaline wetting agent detergent, alkaline salts containing wetting agent, alkaline salts

containing metaphosphate, and acid detergent solution which gave lowest and entirely inadequate detergency. Prerinsing effects demonstrated depressive detergency action with both hard and soft water with all detergents except acid. Better detergency was secured with soft water than with hard water. Highly improved detergency was attained when prerinsing with water containing metaphosphate in slight excess of that required for sequestration of water hardness. After rinsing effects demonstrated improved detergency with alkaline detergents when hard and soft water were used at 150° F. Depressed detergency occurred with acid, wetting agent, and wetting agent plus metaphosphate detergents. However, soft water for final rinse gave better results than hard water. When wetting agent-metaphosphate detergent was used and the final rinse contained 0.10 and 0.15 percent metaphosphate in water containing 300 to 320 p. p. m. hardness, high light-transmission readings were maintained throughout repeated washing trials. Highest and practically complete detergency as measured by light transmission occurred when 0.10 and 0.15 percent wetting agent-metaphosphate detergents were used in the final rinse.

The activity of penicillin in relation to bacterial spores and the preservation of milk, H. R. CURRAN and F. R. EVANS. (U. S. D. A.). (*Jour. Bact.*, 52 (1946), No. 1, pp. 89-98).—In their reaction to penicillin, *Bacillus cereus*, *B. mycoides*, *B. albolactis*, and *B. metiens* were relatively resistant; penicillin was thus not an effective preserving agent except in concentrations that would be impracticable. The remaining 13 species tested were relatively susceptible to penicillin as manifested by strong sporicidal or prolonged sporistatic activity in a drug concentration of 5 μ per cubic centimeter; this concentration sterilized many of the cultures. Penicillin at five units per cubic centimeter greatly delayed but did not prevent spoilage by *Clostridium botulinum* and another unidentified anaerobic species; in the former case, toxin formation accompanied spoilage. The sporistatic period varied with spore concentration and penicillin level. An extremely small proportion of the spores of *C. botulinum* proved highly resistant to the sporistatic action of penicillin. The evidence suggests that all spore cultures contain spores susceptible to penicillin, the species differing in the relative proportion of resistant and sensitive cells. It is concluded that penicillin has no application in the preservation of food; in combination with mild heating, it might have utility as a preservative or spoilage-delaying agent in certain nonfood materials.

The activity of streptomycin in relation to bacterial spores and the preservation of milk, H. R. CURRAN and F. R. EVANS. (U. S. D. A.). (*Jour. Bact.*, 52 (1946), No. 1, p. 142).—The findings presented in this note indicate that streptomycin in ordinary concentrations has a very limited activity against bacterial spores.

A method for producing a dairy spread, K. G. WECKEL. (Univ. Wis.). (*Milk Plant Mo.*, 35 (1946), No. 9, pp. 24-25, illus. 3).—A simplified procedure said to be usable in any modern city market milk plant is described. The product, distributed under the term "Dyne" as the collective trademark of the Wisconsin Alumni Research Foundation, has a butterfat content of 28 percent and a milk-solids-not-fat content of 19 percent. It is pointed out that the food regulations of many States do not provide for a product of this character.

The dual use of the Vacreator for condensing milk and pasteurizing ice cream mix, G. H. WILSTER (*Oregon Sta. Bul.* 430 (1945), pp. 66+, illus. 13; *abs. in Amer. Butter Rev.*, 8 (1946), No. 9, pp. 28, 30, 32, illus. 2).—An extension of the Vacreator process of high-temperature vacuum pasteurization (E. S. R., 84, p. 387) to condensing milk for ice cream mix is described. A simple, practical, and inexpensive method of condensing skim milk to the concentration desired for ice

cream mix, using the Vacreator without any mechanical change as a milk condenser, was devised by which condensed milk of very satisfactory quality was obtained. Condensing the complete mix, using cream and either whole milk or skim milk as sources of fat and milk solids-not-fat, was found to be possible but less convenient and satisfactory.

The quality of the ice cream made when the mix was homogenized, vacuum pasteurized with a Vacreator at 198° F., and immediately cooled was superior to that of ice cream made when the mix was pasteurized by the vat-holding method (160° for 30 min.), homogenized, and cooled. The bacterial content of the homogenized, vacreated, cooled ice cream mix was very low. Negative phosphatase tests were always obtained.

Ice cream of highly satisfactory flavor, body, and texture, and melt-down characteristic was made when the required skim milk was condensed by the Vacreator to the density desired; the required other mix ingredients were added to the condensed skim milk; and the mix was homogenized vacuum pasteurized, and immediately cooled. Whole milk was also successfully condensed, and the ice cream made from the mix with which condensed whole milk was used had a superior flavor to that made from mix with which condensed skim milk was used.

The method of condensing milk with the Vacreator is fully described. Directions for determining the density of the condensed milk and for its subsequent standardization are also given.

Powdered mix, S. D. [i. e. T.] COULTER. (Univ. Minn.). (*Ice Cream Trade Jour.*, 42 (1946), No. 5, pp. 42, 62).—Progress in the development of dry ice cream mix is summarized.

The use of fruit purees in ice cream, C. L. BEDFORD. (Wash. State Col.). (*Ice Cream Trade Jour.*, 42 (1946), No. 5, pp. 44, 80).—This is a discussion of the use of unsweetened fruit purees, frozen sweetened pulp fruit, and pectinized or gelatinized purees.

VETERINARY MEDICINE

Some hereditary abnormalities of domestic animals, F. B. HITT. (Cornell Univ.). (*Cornell Vet.*, 36 (1946), No. 2, pp. 180–194, illus. 6).

Three new *Salmonella* types: *S. richmond*, *S. daytona*, and *S. tallahassee*, A. B. MORAN and P. R. EDWARDS. (Ky. Expt. Sta.). (*Soc. Expt. Biol. and Med. Proc.*, 62 (1946), No. 2, pp. 294–296).—Three new *Salmonella* types were described: *S. richmond* (VI,VII:y-1,2,3 . . .), *S. daytona* (VI,VII:k-1,6 . . .), and *S. tallahassee* (VI,VIII:z₄, z₃₂ . . .). Attention was directed to the necessity of redefining factors z₂₃ and z₂₄ since *S. tallahassee* was agglutinated by both serums as they previously were prepared.

Flagella and flagellar antigens in "non-motile" *Salmonella* cultures, P. R. EDWARDS, A. B. MORAN, and D. W. BRUNER. (Ky. Expt. Sta.). (*Soc. Expt. Biol. and Med. Proc.*, 62 (1946), No. 2, pp. 296–298, illus. 2).—Two apparently nonmotile strains possessed well-developed flagella and flagellar antigens. One of the types (III,XV:e,h) eventually yielded motile elements after serial transfer in semisolid medium. The other (*S. sandiego*) gave no evidence of motility after similar treatment.

A note on *Salmonella abortus-equi* infection in man, D. W. BRUNER. (Ky. Expt. Sta.). (*Jour. Bact.*, 52 (1946), No. 1, p. 147).—A note on an outbreak of food poisoning in Italy from horse meat infected with *S. abortus-equi*.

Newer drugs against bacterial infections, B. VASSEL. (*North Dakota Sta. Cir.* 73 (1946), pp. 16, illus. 1).—This address deals especially with the sulfonamides and penicillin and their therapy.

Some aspects of the pharmacology of the sulfonamides and penicillin, L. M. JONES. (Iowa State Col.). (*North Amer. Vet.*, 27 (1946), No. 7, pp. 422-425, 434).—This is a discussion of methods of administration, toxic reactions, dosage, limitations, and other aspects of use.

Livestock poisoning caused by sulphur in combination with protein concentrates, J. W. TOBISKA and R. JENSEN (*Colo. A & M News*, 1 (1946), No. 3, p. 5).—Following a heavy mortality when pellets of cotton cake, linseed meal, and sulfur were fed to fattening lambs and accidentally consumed by cattle, laboratory tests were carried on with rabbits and sheep. When the pellets were separated into sulfur and protein fractions, neither constituent would kill rabbits, but when recombined the mixture was poisonous. A new mixture of 44 percent each of cotton cake and linseed meal and 12 percent of sulfur flour proved as toxic to rabbits as the original mixture. In paired experiments with sheep no deaths followed the separate feeding of the protein concentrates and sulfur, but the tests with graduated amounts of the mixture indicated that a dosage of 10 gm. per kilogram of body weight approximates the minimum lethal dose for sheep.

The use of DDT in medicine—a review, C. WESTERFIELD. (Ky. Expt. Sta.). (*Vet. Med.*, 41 (1946), No. 10, pp. 355-360, illus. 2).—This review (34 references) deals with the mode of action, limitations, toxicity, and uses of DDT.

Toxicity of alpha naphthyl thiourea for chickens and pigs, W. A. ANDERSON and C. P. RICHTER. (U. S. D. A. et al.). (*Vet. Med.*, 41 (1946), No. 9, pp. 302-303, illus. 1).—Observations are reported of poisoning of young chicks and pigs by the rodenticide ANTU, but apparently less toxicity in older birds. It is regarded as unlikely that under ordinary poisoning operations for rats on farms either young chicks or pigs would be exposed to lethal amounts of ANTU, but care should be exercised in the disposal of poisoned grain and bait. A possible toxicity of ANTU to human beings is also suggested.

Progress in the control of brucellosis (Bang's disease) in domestic animals, W. L. BOYD. (Univ. Minn.). (*Minn. Med.*, 29 (1946), No. 7, pp. 681-683).—A practical statement of present knowledge.

The blood picture in cases of retained fetal membranes in cattle, G. R. MOORE. (Kans. State Col.). (*Jour. Amer. Vet. Med. Assoc.*, 109 (1946), No. 832, pp. 39-45, illus. 1).—Total cell and differential leucocyte counts were made on 100 cases of retained placenta. It was found that there was a marked decrease in the mature neutrophils, beginning within 24 hr. after parturition and reaching its low point at about 72 hr. after parturition and then returning to nearly the normal level at 196 hr. following parturition. This decrease was accompanied by an increase in immature neutrophils and the appearance of toxic granulation, indicating a degenerative "shift to the left." It was suggested that these changes were due to the absorption of toxins from the decomposing placentas.

Ketosis like yet unlike milk fever, J. C. SHAW. (Univ. Md.). (*Jersey Bul.*, 65 (1946), No. 9, pp. 664-665, 722-728, illus. 3).—Ketosis and milk fever are differentiated, data are graphically presented on the blood picture in experimental ketosis, and the dextrose treatment is described.

Penicillin therapy in mastitis, S. D. JOHNSON and M. G. FINCHER. (Cornell Univ.). (*Cornell Vet.*, 36 (1946), No. 2, pp. 138-158, illus. 1).—Details of the study and treatment with penicillin of 213 cows with 316 mastitis quarters in New York State are reported.

It is concluded that results have been good but impaired by the use of incorrect dosages, infrequency of infusion, and the seriousness of some of the cases. The optimum dosage appears to be 25,000 to 100,000 units in 10 to 50 cc. of sterile distilled water given at least three times. The herds given these treatments were uniformly benefited and no harmful results were observed.

Dosages of penicillin for *Streptococcus agalactiae* mastitis, J. J. PORTER, H. M. CAMPBELL, A. F. WEBER, and T. F. REUTNER. (Wis. Expt. Sta.). (*Jour. Amer. Vet. Med. Assoc.*, 109 (1946), No. 832, pp. 60-64.).—Two hundred forty quarters of 120 cows infected with *S. agalactiae* were assigned a dosage of penicillin (sodium) or utilized as untreated controls.

When 30 quarters of 15 cows were treated with 1,000 units, cures in from 1 to 3 treatments were obtained in 14 of the quarters; 5,000 units, 15 quarters; 10,000 units, 18 quarters; 15,000 units, 22 quarters; 30,000 units, 21 quarters; 50,000 units, 19 quarters; and 100,000 units, 22 quarters. In all of the untreated controls, none of the quarters became free of the infection.

The stage of lactation had no apparent effect on the curative process of the treatment. Quarters producing highly abnormal milk at the time of treatment were rarely freed of infection, but in almost every instance the macroscopic appearance of the milk was greatly improved. After the milk returned to normal consistency, which occurred after one to six milkings, no unfavorable change was noted in the production of milk.

Diseases of calves, D. H. UDALL. (Cornell Univ.). (*Cornell Vet.*, 36 (1946), No. 2, pp. 170-180).—This discussion refers especially to diarrhea and pneumonia in calves in New York State, and covers an experience of about 25 yr. It is concluded that sulfathalidine is highly useful in the treatment of diarrhea. Calves raised on nurse cows in pens open on one side are almost completely protected against pneumonia. It is suggested that, in general, diarrhea and pneumonia are independent diseases, affecting calves in different age groups, and that the term "pneumoenteritis" has a very limited application.

Lantana poisoning in cattle, D. A. SANDERS. (Fla. Expt. Sta.). (*Jour. Amer. Vet. Med. Assoc.*, 109 (1946), No. 833, pp. 139-141, illus. 2).—Investigations of a peculiar and often fatal condition affecting both beef and dairy cattle in many areas of the State indicated the cause to be plant poisoning associated with photosensitization resulting from eating the ornamental shrub *L. camara*, which in many sections has escaped from cultivation.

Experimental feedings made with the plant show that amounts as small as $\frac{3}{4}$ to 1 lb. of the mature frosted and dried leaves are sufficient to produce typical symptoms of chronic poisoning of 5 weeks' duration in animals weighing 400 lbs. that are confined in the sunlight.

Cattle which have become familiar with the plant by long association do not usually eat it, but its removal from unfamiliar locations or fencing it off is advocated. Direct sunlight should be avoided with affected animals.

Control of enterotoxemia (pulpy kidney disease) in lambs by the use of alum precipitated toxoid, O. H. MUTH and D. R. MORRILL. (Oreg. Expt. Sta.). (*Amer. Jour. Vet. Res.*, 7 (1946), No. 24, pp. 355-357).—An alum precipitated toxoid was prepared from *Clostridium perfringens* type D, which, when injected into 12 5-month-old lambs, produced a higher antitoxic titer than in 6 lambs given the usual 5-cc. dose of antiserum. In extensive field trials, injections of alum precipitated toxoid apparently reduced enterotoxemia losses and appeared to be a promising method.

Vitamin E prevents and cures the "stiff-lamb disease," J. P. WILLMAN, J. K. LOOSLI, S. A. ASDELL, F. B. MORRISON, and P. OLAFSON. (Cornell Univ.). (*Cornell Vet.*, 36 (1946), No. 2, pp. 200-204).—Experiments in 1945 are reported, repeating those previously noted (*E. S. R.*, 93, p. 328). No death losses resulted in 17 stiff lambs given the disodium salt of *d,l*- α -tocopherol phosphoric acid ester either subcutaneously or as a drench or *d,l*- α -tocopherol acetate in olive oil, while of 8 untreated lambs 3 died and 2 were destroyed in a helpless condition.

Feeding sulphur to lambs cuts gains but prevents "overeating" death losses. A. L. ESPLIN, A. W. DEEM, and W. E. CONNELL (*Colo. A & M News*, 1 (1946), No. 3, pp. 6-7, illus. 11).—In a test carried on to evaluate the effect of sulfur on death loss from enterotoxemia, four lots of 500 70-lb. lambs each were fed a grain mixture of corn and barley 1: 1, whole alfalfa hay, and salt. Two lots were self-fed and two hand-fed the grain mixture, with one lot in each group also receiving 2 percent of sulfur in the grain mixture.

The average daily grain consumption was smaller in the lots receiving sulfur. Their average daily gains were 0.35 and 0.31 lb. for those self-fed and hand-fed, respectively, and compared with 0.4 and 0.33 for the control lots. However, the death loss was only 1.8 and 1.0 percent in the self-fed and hand-fed lots receiving sulfur, as compared with 6.6 and 9.6 percent for the controls, and the sulfur-fed lambs showed 68 and 46 ct. more profit per head. No effect on the flavor of the meat was noted.

Lead arsenate relieves scouring in lambs due to tapeworm infestation. R. T. HABERMANN and F. N. CARLSON. (U. S. D. A., S. Dak. Expt. Sta., et al.). (*Vet. Med.*, 41 (1946), No. 9, pp. 306-310, illus. 4).—Observations at Newell, S. Dak., indicated that tapeworms are an important cause of scouring in lambs in the area. In trials with lead arsenate on 26 tapeworm-infested lambs, doses of 1 gm. of the drug removed, safely and effectively, a high percentage of *Moniezia expansa*, and the treatment proved remarkably effective in curing scouring. However, none of the fringed tapeworms (*Thysanosoma actinoides*) which were present in 6 of the lambs were removed by the lead arsenate treatment.

Treatment of filarial dermatosis of sheep with antimony compounds. H. E. KEMPER and I. H. ROBERTS. (U. S. D. A.). (*Amer. Jour. Vet. Res.* 7 (1946), No. 24, pp. 350-354).—Tartar emetic in combination with emetine hydrochloride, tartar emetic alone, tartar emetic with glucose, Trichicide, anthiomaline, and fuadin were tested on a limited basis for their effectiveness in curing filarial dermatosis of 15 sheep. Tartar emetic with emetine hydrochloride, and tartar emetic alone, produced complete healing of characteristic lesions of this parasitism, but abscess formations at site of injections were not uncommon. Tartar emetic with glucose, and Trichicide, a product containing sodium antimony tartrate, trypan blue, and phenol, brought about recovery without untoward sequels. To effect healing, all the above preparations required from 6 to 8 intravenous or intramuscular injections. However, preliminary tests with anthiomaline and fuadin showed distinct promise of bringing about uncomplicated recovery with single injections of large doses.

Hexachlorethane-bentonite suspension for the removal of the common liver fluke, *Fasciola hepatica*, from sheep. O. W. OLSEN. (U. S. D. A.). (*Amer. Jour. Vet. Res.*, 7 (1946), No. 24, pp. 358-364).—Hexachloroethane prepared as a suspension with bentonite and water proved to be an effective fasciolicide for sheep when given as a drench. Of 110 infected sheep given 30 cc. of suspension (15 gm. of hexachloroethane), 104 did not show eggs of the liver fluke in the feces following a single treatment. Little change occurred in the number of eggs of 3 animals whose original counts were 16 per gram or less. The remaining 3 showed only 4 eggs per gram as compared with a premedication count of 60 to 112. There was even greater effectiveness when administered at a dose rate of 60 cc. (30 gm. of hexachloroethane) per animal.

Immature flukes were more resistant to hexachloroethane than mature flukes, suggesting the importance of treating during the season when the fewest immature flukes are present in the body of the host. In these tests, hexachloroethane was well tolerated in doses far in excess of the amounts required to remove the flukes. However, a footnote is appended to the paper which states that "since this paper

was submitted for publication, some instances of intoxication and death, for which there is no obvious explanation, occurred in one locality outside the coastal area of Texas following treatment of sheep with hexachloroethane, as well as with a standard dose of carbon tetrachloride."

The life history of *Ostertagia ostertagi*, W. L. THELKELD (Virginia Sta. Tech. Bul. 100 (1946), pp. 14, illus. 31).—This study of the preparasitic stages of the development of *O. ostertagi* and results obtained from oral administrations of the infective larvae of this species revealed a life history similar in many aspects to the developmental stages of *O. circumcincta* (E. S. R., 71, p. 388). Adult worms incubated at 37.5° C. in Ringer's solution deposited eggs 70 μ –80 μ long by 40 μ –45 μ wide, which hatched in 12 hr. after deposition. Eggs obtained from freshly drawn feces and incubated at room temperature hatched in 24 hr. First-stage larva ranged in length from 300 μ to 450 μ . The first ecdysis occurred on the second day after the emergence of the first-stage larvae. Typical second-stage larvae appeared on the third day. They averaged about 800 μ in length and possessed a typical rhabditiform esophagus. No second ecdysis of second-stage larvae was observed. Third-stage larvae appeared on the fifth and sixth days. The length of these larvae was from 800 μ to 900 μ . "Forty-eight hr. after the oral administration of the third-stage or infective larvae to calves, these larvae are found in the abomasum unchanged as to length or appearance. At 72 hr., the larvae are undergoing ecdysis and some have penetrated the mucosa. At this stage sex differentiation could not be determined. Larvae found in the mucosa at 96 hr. had completed their second ecdysis and were in the second parasitic stage. Sex differentiation could be made at this age." Photomicrographs at magnification X100 of larvae in the walls of the mucosa indicated that after the ninety-sixth hour the larvae remain sheathed until the tenth day after oral administration. Larvae found free in the abomasum at 10 days were sheathed or have undergone their final ecdysis. Larvae at 15 days were in the immature adult stage and were found free or attached to the mucosa and some were found coiled within nodules or lesions within the mucosa. On the twenty-first day following the oral administration of infective larvae, mature male and female worms were present in the abomasum. The uteri of the female contained 20 to 30 eggs in an advanced degree of development. On the twenty-third day eggs appeared in the feces. While the blastomeres could not be counted with accuracy, it appeared that the majority are in the 16- to 32-cell stage. Some eggs displayed greater development, and in a few worms immature motile larvae could be observed. In calves exposed for 2 weeks to infective *O. ostertagi* larvae in paddocks and then maintained indoors for 2 and 3 weeks, immature adults were found coiled within the mucosa. A few were found between the adjacent walls of the folds of the fundus. The posterior section of adult females were found in the lesions in the mucosa. It appeared that in some cases eggs were in process of deposition as they were in the vagina and the oviducts. Capsules containing eggs (presumably *O. ostertagi* as no extraneous species were found) were observed within the walls of the mucosa.

Parasites and parasitic diseases of swine, H. C. H. KERNEKAMP. (Minn. Expt. Sta.). (Vet. Med., 41 (1946), No. 9, pp. 315–318, illus. 1).—This discussion deals especially with ascariasis and pulmonary strongylosis.

Preliminary report on the propagation of hog cholera virus in vitro, W. H. BOYNTON. (Univ. Calif.). (Vet. Med., 41 (1946), No. 10, pp. 346–347, illus. 1).—A modification of the serum ultrafiltrate method of tissue culture and propagation of viruses developed by H. S. Simms and M. Sanders⁴ is described.

⁴ Arch. Pathol., 33 (1942), No. 5, pp. 619–635, illus. 3.

Observations regarding *Salmonella choleraesuis* (var. *kunzendorf*) septicemia in swine, L. SEGNETTI. (Mont. Expt. Sta.). (*Jour. Amer. Vet. Med. Assoc.*, 109 (1946), No. 833, pp. 134-137.)—Observations of septicemic salmonellosis involving some 400 pigs on six premises are reported. The onset of the disease was acute, and the cardinal symptoms were a marked rise in temperature, posterior incoordination, and weakness. The mortality was not great and ceased of its own accord after a small percentage of the pigs had died. Macroscopically, the lesions were indistinguishable from those ascribed to hog cholera. However, *S. choleraesuis* was repeatedly recovered from pigs dying of this disease, whereas bacteria-free filtrates prepared from blood and other organs when injected into cholera-susceptible pigs failed to produce a reaction.

Pig typhus (Salmonellosis suis), L. VAN ES (*Nebraska Sta. Res. Bull.* 147 (1946), pp. 28, illus. 9.)—This discussion deals with the infectious necrotic enteritis caused by *Salmonella suispestifer*, taking up its etiology, epizootiology, clinical manifestations, pathologic anatomy, diagnosis, economic importance, meat poisoning in man, therapy, and prophylaxis. A list of 105 references is appended.

The incidence of blood spots in eggs and its relation to first year mortality, I. M. LERNER. (Univ. Calif.) (*Poultry Sci.*, 25 (1946), No. 4, pp. 392-394.)—Two series of Single-Comb White Leghorn pullets hatched in consecutive years were studied. The incidence of blood spots in their eggs after adjustment for hereditary differences and season was in general higher in birds which survived the first laying year than in those which died.

Toxicity of choline in the diet of growing chickens, V. H. MELASS, P. B. PEARSON, and R. M. SHERWOOD. (Tex. Expt. Sta.). (*Soc. Expt. Biol. and Med. Proc.*, 62 (1946), No. 2, pp. 174-176.)—Various levels of choline chloride were added to rations fed to growing chickens. The addition of 1, 2, and 4 percent reduced the rate of gain by about 12, 13.8, and 23.8 percent, respectively. As much as 4 percent of choline chloride added to the diet produced no toxic manifestations other than retarded growth.

Toxicity of sodium chloride solution for baby chicks, E. R. DOLL, F. E. HULL, and W. M. INSKO, JR. (Ky. Expt. Sta.). (*Vet. Med.*, 41 (1946), No. 10, pp. 361-363.)—Water from a saline or "soda-water" well containing chlorine equivalent to 0.54 percent sodium chloride and sodium equivalent to 0.7+ percent of sodium chloride was found to be toxic for young chicks. Experimental use of solution of C. P. NaCl in concentration of 0.5 percent and 0.9 percent as drinking water produced disease in day-old chicks identical with that resulting from use of the well water. Clinical evidence of toxicity was not observed in chicks receiving 0.25 percent NaCl during 3- and 4-week trials. Concentrations of 1.5 and 2.0 percent NaCl in the water caused acute toxicity with nervous disturbances, including somnolence, convulsions, incoordination, and inability to stand.

Effect of sulfaguanidine on caecal coccidiosis, K. C. SEEGER and A. E. TOMHAVE (*Delaware Sta. Bul.* 260 (1946), pp. 19.)—The effectiveness of sulfaguanidine in controlling losses and establishing immunity from cecal coccidiosis in artificially inoculated chicks was demonstrated in a group of four experiments. Similar results were obtained when this inoculation-treatment procedure was applied to two commercial flocks of broilers. When the infection with cecal coccidiosis was light, as indicated by a mortality of 15.1 and 11.3 percent in the untreated pens of two experiments, protection was almost complete in corresponding pens of chicks receiving 0.5, 0.75, and 1 percent levels of sulfaguanidine. When infection was heavy, causing 94.6 percent mortality in the untreated pen, the mortality in the corresponding pens receiving 0.5 and 0.75 percent sulfaguanidine ranged from 20 to 54.1 percent. An 80 and 83.3 percent mortality in untreated pens corresponded to 2.7 and 3.6 percent mortality in pens receiving

1 percent sulfaguanidine. A relationship between the severity of the disease and the amount of the drug necessary to give complete protection from losses was thus indicated.

Chicks that had been inoculated and treated were found to be completely immune to a second inoculation without a second treatment. Inoculated chicks developed the disease in unison, while in natural outbreaks the disease developed in series in the chicks. A period of consecutive days' treatment as used successfully in inoculated birds was found not applicable in the control of natural outbreaks.

When chicks were treated for a continuous period of time beginning before or at the onset of a natural outbreak of cecal coccidiosis, symptoms and losses were checked, but susceptible chicks remained and went through the disease after termination of treatment. A schedule of intermittent sulfaguanidine feeding coordinated with the development of the natural outbreak appeared to give the greatest protection from losses in birds passing through a natural infection with cecal coccidiosis. The schedule used consisted of three 1-day feedings of 1 percent, or 1 lb. of sulfaguanidine in 100 pounds of mash, beginning with the first sign of the disease and allowing 4 days between treatments.

"In naturally developing cecal coccidiosis, treatment apparently must be short and repeated. The degree of success of the treatment will depend on the proper coordination of the sulfaguanidine feeding with the course of the disease."

Seventh annual report of the Regional Poultry Research Laboratory, East Lansing, Michigan, July 1, 1945, to June 30, 1946 (*U. S. Dept. Agr., Bur. Anim. Indus., [1946], pp. 11+*).—This report again (*E. S. R., 94, p. 259*) deals largely with studies on lymphomatosis. A table shows that the mortality to 300 days of age for 7 resistant lines amounted to 11.4 percent as compared with 24.9 percent for 7 susceptible lines. Additional information on natural transmission confirmed the results previously reported that breeding, the age of the chicken at the time of exposure, the degree of exposure to the causative agent, and the environmental conditions under which the birds are raised influence the incidence of lymphomatosis. In studies on transmission by inoculation, a high degree of success was attained in transmitting a condition that stimulates lymphomatosis when cellular material from lymphomatous birds is used as an inoculum. In certain cases of naturally occurring visceral lymphomatosis, a cell-free filtrate was prepared from tumorous organs which will produce lymphomatous tumors in susceptible recipients after an incubation period of 4 to 6 mo. which are indistinguishable from lesions of the naturally occurring disease by all criteria employed. Filtrates prepared from these tumors will produce similar tumors when passed to the next group of recipients, and the tentative conclusion is drawn that the filtrate contains an agent which has some of the properties of a virus.

Preliminary research suggested the possibility of differentiation in degrees of resistance in stock by the use of carcinogenic compounds. White Leghorn chickens known to be relatively resistant to lymphomatosis showed a much lower incidence of induced tumors among young chickens from inoculation of the carcinogenic agent than occurred among chicks from known susceptible lines.

Sulfamerazine given at the rate of one-half of 1 percent of the diet for a period of 300 days failed to reduce the incidence of lymphomatosis in a group of 37 females no less than that which occurred in a group of 46 birds not receiving the drug.

In comparative pathologic studies of neural lymphomatosis and symptomatically related diseases, cases of clinical paresis in 10-day-old and 6-week-old chickens were found at the Connecticut Storrs Station to be due to astrocytomas

in the mesencephalon and another case in a 6-month-old pullet to traumatic tendinitis. Two cases of parietic Newcastle disease were found associated with myelocytomatosis and neural lymphomatosis, respectively, with the latter case showing perivascular cuffs, characteristic of lymphomatosis, in the white matter and typical glia foci characteristic of Newcastle disease, in the gray matter of the spinal cord. The diagnosis of Newcastle disease was confirmed serologically.

Results of inoculations of chicks and eggs at the Indiana Station in a study of the transmission of visceral lymphomatosis are also reported.

Newcastle disease in poultry, F. R. BEAUDETTE. (N. J. Expt. Stas.). (*Cornell Vet.*, 36 (1946), No. 2, pp. 105-117).—This review deals with species affected, symptoms and autopsy findings, laboratory diagnosis, and control, especially as to the merits of a program of complete eradication by slaughter methods.

Use of the rapid whole-blood test for pullorum disease, H. BUNYEA, revised by W. J. HALL, A. D. MACDONALD, and R. R. HENLEY. (U. S. Dept. Agr., *Misc. Pub.* 349, rev. (1946), pp. 19, illus. 9).—This is a revision of the edition previously noted (E. S. R., 81, p. 847).

The efficacy of recently developed sulfonamides against fowl typhoid, E. N. MOGRE. (Del. Expt. Sta.). (*Poultry Sci.*, 25 (1946), No. 4, pp. 307-311).—Using lots of from 3 to 10 chicks of various ages, five sulfonamides were tested to determine their value in protecting birds artificially inoculated with *Salmonella gallinarum*. Sulfamerazine and two sulfonamide compounds were found to be highly effective in reducing the mortality, which ranged from 0.0 to 16.7 percent except in one lot which received 0.2 percent of a sulfonamide and showed a mortality of 50 percent. Sulfathalidine and sulfasuxidine were less effective, and the mortality rate varied with them from 33.3 to 83.3 percent.

"Due to the variables introduced in this experiment and the small number of experimental birds used, this study merely serves to demonstrate the relative efficiency which might be expected from the five sulfa drugs used. Further research will be conducted to determine the true value of the more promising drugs under field conditions."

A factor in delayed production of *Eimeria tenella* oocysts, E. M. DICKINSON. (Oreg. State Col.). (*Poultry Sci.*, 25 (1946), No. 4, pp. 391-392).—Observations on oocysts propagated after various periods indicated that the older a culture of *E. tenella* the more delayed is the production of oocysts and apparently also the formation of schizonts. Freshly propagated and sporulated oocysts produced from a delayed culture, however, promptly returned to a shorter cycle.

Observation of swine erysipelas in turkeys (including the public health aspect and possible human cases), G. W. STILES. (U. S. D. A.). (*Jour. Amer. Vet. Med. Assoc.*, 109 (1946), No. 832, pp. 65-69, illus. 2).—Following a rainstorm and snowstorm late in September, swine erysipelas developed in a flock of 2,500 tom turkeys near Colorado Springs, Colo. Later the disease spread to a flock of 5,000 younger toms and hens. Death loss in the flock was about 10 times greater in the toms than in the hens. *Erysipelothrix rhusiopathiae* organisms were recovered on culture from 8 dead turkeys, and identified bacteriologically from the blood, liver, spleen, kidneys, bone marrow, brain, and subcutaneous tissues of the head. Infected pigs purchased during the summer appeared to be the probable immediate source of infection.

Fowl typhoid diagnosed in guinea fowl, E. N. MOORE. (Del. Expt. Sta.). (*Poultry Sci.*, 25 (1946), No. 4, pp. 387-389).—Fowl typhoid was diagnosed in a flock of guineas on a farm where it previously had been found involving the chickens and turkeys. Attempts to diagnose the disease among ducks and geese on this farm failed. It was not possible to determine definitely the primary source of infection on the farm.

Symptoms of fowl typhoid infection among the guineas were of little diagnostic value, for the birds appeared normal until a day or two before death. Just prior to death the infected birds became pale, listless, and refused to eat. "Poultrymen attempting to eradicate fowl typhoid or pullorum disease from a farm should consider the possibility of the guinea fowl acting as a carrier of one or both diseases."

Salmonella bareilly in quail, H. E. RHODES. (Univ. Ill.). (*North Amer. Vet.*, 27 (1946), No. 7, p. 419).—This organism was isolated from a group of quail chicks with a reported mortality of 60 percent.

AGRICULTURAL ENGINEERING

Surface water supply of the United States, 1944 parts 1, 2, 8, and 12 (*U. S. Geol. Survey, Water-Supply Papers* 1001 (1946), pp. 634+, illus. 1; 1002 (1946), pp. 552+, illus. 1; 1008 (1946), pp. 311+, illus. 1; 1012 (1946), pp. 261+, illus. 1).—These papers record measurements of stream flow for the year ended September 30, 1944, No. 1001 covering the North Atlantic slope basins; No. 1002 the South Atlantic slope and eastern Gulf of Mexico basins; No. 1008 the western Gulf of Mexico basins; and No. 1012 the Pacific slope basins in Washington and upper Columbia River Basin.

Water levels and artesian pressure in observation wells in the United States in 1943.—Parts 3, North-Central States; 4, South-Central States, O. E. MEINZER, L. K. WENZEL, ET AL. (*U. S. Geol. Survey, Water-Supply Papers*, 988 (1946), pp. 352+, illus. 10; 989 (1946), pp. 194+, illus. 13).—These papers record water levels and artesian pressure in observation wells in the North Central and South Central States for the year 1943. For wells not previously reported complete records are given, including those for the years before 1943, while for wells whose previously records have been published this volume records only the current year.

Ground water supply of Prospect Valley, Colorado, W. E. CODE. (Coop. U. S. D. A.). (*Colorado Sta. Tech. Bul.* 34 (1945), pp. 40, illus. 13).—A report of the results of a study of water-table fluctuations in Prospect Valley, begun in 1933 in connection with a general observational program of water-table fluctuations in pumping districts of the South Platte Valley. Prospect Valley comprises about 12,500 irrigated acres and the water table now stands at from 25 to 100 ft. below the ground surface. Analysis of the accumulated data indicates an average surface water supply of 5,500 acre-ft. with a safe underground water yield of 9,860 acre-ft. With an indicated field duty of 1.8 acre-ft. per acre the present area irrigated should be reduced some 4,000 acres, for should water conditions prevail as in average years and the present area be maintained, economic exhaustion will occur in from 14 to 18 yr.

The bonding action of clays.—II, Clays in dry molding sands, R. E. GRIM and F. L. CUTHBERT (*Ill. Engin. Expt. Sta. Bul.* 362 (1946), pp. 46, illus. 17; also *Ill. State Geol. Survey Rpt. Invest.* 110 (1946), pp. 36+, illus. 17).—This is a continuation of a fundamental study of bonding clays in dry sands (E. S. R., 94, p. 117). The objective of this study was to provide information leading to a better understanding of the properties of molding sands and bonding clays and hence to the more economical production of better castings.

"Data are presented showing the relation of dry compression strength to amount of tempering water for varying amounts of each type of clay. . . . Sands bonded with halloysite or kaolinite clays are unique in that they develop greatly increased strength without much loss of water when rammed specimens are allowed to dry slowly. This so-called air-set strength is different from green

strength or dry strength and was not found in sands bonded with montmorillonite or illite clays.

"A theory of dry strength is presented based on the wedge-block concept of holding strains in place. Air-set strength develops because a certain amount of time (measured in minutes) is required for some of the tempering water to penetrate masses of halloysite or kaolinite clay and to become fixed so that a strong wedge-block is formed.

"Because of air-set strength and other properties of some clays, it is difficult or for some clays impossible to predict the strength of a partially dried mold from simple green or dry strength determinations."

Nomograph for calculation of over-all heat transfer coefficients, H. J. GABER and W. LICHT, JR. (*Indus. and Engin. Chem.*, 38 (1946), No. 7, pp. 757-759, *illus.* 1).—The authors present a nomograph which has been developed to aid in the solving of equations dealing with the rate of heat transfer from one fluid to another separated by a solid wall. Values of heat transfer coefficients can be determined for walls of flat sheets, curved sides such as pipes, and spheres. Example problems to illustrate the alining technic of the charts are also given.

The double-edged stationary potato cutting knife for saving labor, reducing the spread of ring-rot, and reducing equipment costs, J. L. PASCHAL, G. H. LANE, and W. A. KREUTZER (*Colorado Sta. Bul.* 493 (1946), pp. 12, *illus.* 10).—A descriptive account for the construction of the machine with directions for its disinfection and use.

Farm buildings, J. C. WOOLEY (*New York and London: McGraw-Hill Book Co.*, 1946, 2. ed., pp. 354+, *illus.* 199).—A book designed to aid in the presentation of subject matter by instructors to students, but also of value to farm managers, appraisers, county agents, and farm operators. The division into chapters is made from the standpoint of a unit for study rather than for the subject matter contained, thus: (1) General, (2) livestock and poultry buildings, (3) air-conditioning farm buildings, (4) building materials, (5) structural design, (6) buildings for storage, (7) the farm home, and (8) drafting.

Handbook on design of slatted floor barn hay-driers (Blacksburg: Va. Polytech. Inst., 1946, pp. 27+, *illus.* 17).—The handbook is assembled by R. E. McKnight, and provides information on the design of slatted floor barn hay driers for the use of personnel actively engaged in the design of these systems. The design data presented represent the results of hay drier research work at the Virginia Polytechnic Institute in cooperation with the Virginia Farm Electrification Council as well as practical experience gained in the field. The design problem is divided into the following major phases: (1) Introduction, (2) requirements of the building, (3) parts of the system and their functional use, (4) types of air distribution systems, (5) selecting equipment, (6) design of the air distribution system—two examples with solutions, and (7) appendix of formulas.

Storing turnips in bins with forced ventilation: A progress report, D. COMIN and W. JUNNILA (*Ohio Sta. Bimo. Bul.* 240 (1946), pp. 73-76, *illus.* 1).—The authors report the results of one exploratory test for aerating a large pile of turnips with a blower arrangement similar to that used for drying hay in the mow. There was no difficulty in preventing an undue rise in temperature within the pile of 2,300 bu. at any time, and though the average temperatures throughout the storage period were higher than the most desirable value of 32° F. the turnips with one exception were in fine condition for marketing. The roots in a spot 5 ft. in diameter and 2 ft. down from the top surface of the pile did not keep well for field containers were dumped at this point and the space between the roots filled up with earth and trash which interfered with the free circulation of air. On the basis of this exploratory experience the feasibility of storing root crops in

large piles is indicated. "Further detailed experiments should indicate the value of the method under many environmental conditions and with other vegetables."

AGRICULTURAL ECONOMICS

Current Farm Economics [June and August 1946] (*Cur. Farm Econ. [Oklahoma Sta.]*, 19 (1946), Nos. 3, pp. 55-99+, *illus.* 2; 4, pp. 103-132+, *illus.* 3).—Included in both issues are the usual reviews of the agricultural situation and tables of prices and price indexes, and No. 3 also contains articles on Farm Real Estate Activity in Oklahoma, 1945, by R. T. Klemme, L. A. Parcher, and E. C. Ford (pp. 69-93), which supplements Bulletin 291 (E. S. R., 95, p. 117); and Farmers' Returns From Fattening Lambs on Winter Wheat Pasture, Tonkawa Area, 1944-45, by W. F. Lagrone (pp. 94-97) (both coop. U. S. D. A.), which indicates that under the price relationships that prevailed in 1944-45, feeding grain at the rate reported by farmers with the highest gains to supplement wheat pasture resulted in returns per acre of wheat grazed that were only moderately larger than returns realized from lambs allowed about the same acreage per head but receiving no supplemental grain feeding.

No. 4 also contains The Oklahoma Cattle Industry in 1946, by A. W. Jacob (pp. 115-121); Oklahoma Farm Mortgage Debt, 1945, by R. T. Klemme (pp. 122-125); and Returns From Wintering Yearling Cattle on Wheat Pasture, Texas County, 1944-45, by W. F. Lagrone (pp. 125-129), which indicates that substantially larger incomes were realized from wintering yearlings on wheat pasture than would have been realized from renting out this pasture at the going rental rate. Best gains were made when the grazing period was extended 75 days or longer. When wheat pasture of average or better quality was available, best returns per acre were obtained by allowing 3 to 4 acres per yearling.

The farmer in the modern world, T. S. HARDING. (U. S. D. A.). (*Rural Social.*, 10 (1945), No. 1, pp. 3-9; *Span. abs.*, p. 3).—The economic position of the farmer has grown increasingly worse with the improvement of farm technology. For years he has received a very small percentage of the national income in comparison with his proportion of the total population. Effective demand has not been great enough to consume his products, and, consequently, he had received no increase in income. Food prices have not been raised because that would necessitate an increase in the wages of labor; to this industry will not agree. As a result, industrial workers are unable to buy all the foodstuffs they need. At the same time, farmers cannot sell everything they produce. Two ways of meeting the farm and industrial problem have been suggested. The first is direct; it deals with the basic ills, mass employment and chronic overproduction, but involves collective action of democratic government to attain beneficial social and economic objectives and is not in accordance with the traditions of the American people. Also, such a plan would require more government control and planning. The second course of action assumes that nothing can be done about the basic cause of the difficulty, and efforts are made to treat the effects of a very imperfect society. Thus, the problem is never solved because the core of the matter is never removed.

Changes in farming in war and peace, S. E. JOHNSON (*U. S. Dept. Agr., Bur. Agr. Econ.*, 1946, F. M. 58, pp. 99+, *illus.* 36).—This report summarizes a study that was begun in the fall of 1944 with the objectives of analyzing the changes in farming during the interwar and war years, appraising the forces back of the large increases in production, and evaluating some of their peacetime implications. The author discusses the significance of wartime changes, the foundation for increased production, and peacetime implications of interwar and wartime changes.

Historical perspectives for post-war agricultural forecasts: 1870-1940, A. W. ZELOMEK and I. MARK (*Rural Sociol.*, 10 (1945), No. 1, pp. 48-70; *Span. abs.*, p. 48).—"In planning for the future the agricultural experts postulate a post-war boom in American agriculture. Their 'forecasts' and 'projections' of a buoyant future give insufficient explicit consideration to depressive factors which in the past cast their shadows over the agricultural scene. Hence it is desirable to reexamine the past trends to prepare realistically for the future. A survey of American agriculture from 1870 to the World War II imbues one with a healthy scepticism. Although agricultural fortunes have waxed and waned, the secular trend has exhibited, in the main, preponderatingly depressive features. What expansive and contracting factors have yielded this result? How have they operated in the two main periods—1870-1920; 1920-1940? Could the farmer extricate himself from the impact of mounting production costs and falling prices? Through what remedial programs has he tried to do so? An understanding of the basic factors and their operation is indispensable to any realistic consideration of future plans and prospects."

Economics of scale of farming in the southern San Joaquin Valley, California, J. K. LEE (*U. S. Dept. Agr., Bur. Agr. Econ.*, 1946, pp. 185+, *illus.* 19).—This is a study of the effect of size of farm upon the efficiency of operation and upon the returns to individuals directly dependent upon agriculture for their livelihood.

It is concluded that "the large and medium-large farms have a slight advantage over the medium-size farms in output per unit of capital employed. But judging from past performance the medium-size summer-field-crop and dairy farms and the medium-large fruit farms have the advantage over other size groups studied in maximizing work opportunity, agricultural production, and the potential trade, or in maximizing income for the maximum number of people directly dependent upon agriculture for their livelihood."

Postwar readjustments in Massachusetts agriculture, D. ROZMAN (*Massachusetts Sta. Bul.* 430 (1946), pp. 35, *illus.* 19).—The author concludes that in the postwar period adjustments in Massachusetts agriculture will be needed both to correct previous maladjustments and to meet new developments and situations. His analysis of commercial farming units in Massachusetts indicates that more than half of them fail to meet the desirable requirements of income for farm families. The greatest need is for the reconstruction of substandard farming units into efficient, economic family farms capable of providing an adequate level of living under modern conditions. The best opportunity for such reconstruction is found in the rebuilding of lad resources which are at the basis of farm operations. Large areas of undeveloped farm land of suitable quality are available both on farms and in adjacent rural areas. Recent experience with modern power machinery, especially bulldozers, power shovels, and bog harrows, indicates that there is a good possibility for land clearing and development through removal of stones and stone walls, clearing of trees and brush, and drainage of fields. The irregular distribution of the available land and the complicated pattern of land ownership present some difficulties in adding new tracts from undeveloped areas to existing farm units. Management of farm woodlands, which represent about 37 percent of the total area of Massachusetts farms, will have to be integrated with other farming operations to secure higher returns to the producers. The improvement in the condition and productivity of pasture and hay lands, the most important assets in Massachusetts agriculture, will reduce costs and improve the position of many Massachusetts farms. The position of Massachusetts agriculture in the postwar period will be determined by the success in reduction of costs through the adoption of the most efficient

methods, whether they are in the use of land resources, the employment of labor, the use of machinery, or the marketing efforts.

Looking forward in Oklahoma agriculture. L. E. HAWKINS, P. NELSON, ET AL. (Coop. U. S. D. A. et al.). (*Oklahoma Sta. Bul.* 299 (1946), pp. 92, illus. 9).—This is a summary, prepared by the farm press and State and Federal agencies, dealing with agricultural and industrial development, production opportunities, physical resources for agriculture, agricultural credit, marketing and distribution, land tenure, and rural life and community organization.

Looking forward in Oklahoma agriculture.—A summary (*Oklahoma Sta. Cir.* 123 (1946), pp. 14).—This is a summary of Bulletin 299, noted above.

Agricultural adjustments to improve farming opportunities (*South Carolina Sta. Rpt.* 1945, p. 10).—It is stated that if the 1946 suggestions made were adopted, the percentage of cropland idle in the State could be cut in half and the percentage of cropland which is double-cropped could be increased about one-third in comparison with 1945. Some shifts from corn to small grain in the drier areas would provide opportunity for more double cropping, increase the feed supply, and substantially reduce the costs of production. Compared with the prewar years, 1937–41, there were, on farms in this State in 1945, 11 percent more milk cows, producing 14 percent more milk; 39 percent more hens and pullets, laying 70 percent more eggs; 111 percent more broilers and 188 percent more turkeys produced; and 15 percent more cattle and calves. Still further increases are suggested for 1946 with reason to believe that under the cropping program proposed, feed supplies would be adequate for the purpose.

The economic outlook in Sumter, South Carolina. J. M. STEPP and S. F. PHILLIPS, JR. (*South Carolina Sta. Bul.* 365 (1946), pp. 29, illus. 7).—This survey indicates that the employment problem in Greater Sumter during the next few years will be one of adjustments between race and sex rather than an overall shortage or surplus of workers. In view of the prospective surplus of Negro workers, there are opportunities for businesses offering employment to Negroes. An ample supply of white as well as Negro workers during the next few years is indicated, so that a variety of industrial and business development is not only possible but necessary if Sumter is to avoid considerable unemployment or considerable loss of population through migration. The survey indicates that the residents of Greater Sumter plan to build more than twice the number of houses during these 2 postwar years than they built during 1939 and 1940, and that nearly two and one-half times as much money will be spent on house repairs as was spent immediately before the war. The automobile industry will provide additional jobs. Finally, the mercantile and service establishments would realize increased prosperity if the Negroes of Sumter and Sumter County were provided with more productive and higher-paid work. The same is true for the low-paid white workers, but they are not nearly so numerous as the low-paid Negroes.

The survey was based largely on returns from approximately 500 questionnaires from all economic groups and institutions in the city and its suburbs.

Charting a route for agriculture in West Virginia. F. D. CORNELL, JR., ET AL. (*West Virginia Sta. Spec. Cir.* 2 (1946), pp. 64).—This is a basic statement concerning the conservation and use of the agricultural resources of West Virginia, prepared by the Post-war Planning Committee appointed by the director of the station for the purpose. The successive chapters deal with the general situation, population, the land and its resources, production and production factors, land, settlement, tenure, and farm labor, agriculture-industry relations, and farm family and community living.

Postwar employment opportunities in an agricultural community. A. D. EDWARDS and I. A. SPAULDING (*South Carolina Sta. Cir.* 72 (1946), pp. 15, illus.

4).—From the sample of one-third of the households of the white population of the Hollywood community in Saluda County in 1944 and 1945 39 males were reported as absent from the community as a result of the war; of these, 33 were engaged in military service and 6 were employed at work outside the community. Opportunities were noted for purchasing and renting land after the war for about one-fourth of these men. The services most needed, as indicated by both owners and tenants, are those of a market for eggs and poultry and of a physician. Other needed services include those of an electrician, dentist, nurse, and teacher of an auto mechanics or machine repair course, shoe repair shop, and radio repair shop. Another opportunity is to be found in custom farming. The use of a tractor was hired more frequently by farm owners than by farm tenants, but among both tenure segments there was a demand for their use which was not met. Interest in postwar repair of dwellings gives promise of possible employment in carpentering and allied activities, although the need for the services of a carpenter in the community was rated low by both farm owners and tenants. The analysis of the community members' intentions to make purchases after the war indicated that they will furnish a market for household appliances more readily than for farm machinery and equipment. The installation of electricity in more homes after the war would, without doubt, increase the opportunity for the sale of such commodities.

Land tenure in Arkansas.—IV, Further changes in labor used on cotton farms, 1939-44, O. T. OSGOOD and J. W. WHITE. (*Arkansas Sta. Bul.* 459 (1945), pp. 31, illus. 6).—This fourth bulletin (E. S. R., 90, p. 115) is based on a follow-up survey of farms included in a previous study (E. S. R., 84, p. 113).

Declines in number of resident families and single wage hands per 10,000 acres of cropland from 1939 to 1944 in the various counties in which surveyed farms were located ranged from about 40 in Pulaski and Independence Counties to 132 in Chicot County. Percentage declines by counties were: Chicot 35 percent, Mississippi 25, Pulaski 14, Clark 36, Pope 41, and Independence 32. Accompanying the decline in number of families was a redistribution of families by tenure. In each of the delta counties, beginning about 1941, there was a considerable shift from wage families to share croppers and some shift to renters, particularly in Chicot County. Wage families, more than any other group, moved to nonfarm employment. In 1944 share croppers made up a major part of the labor force in all except the upland counties. Share renters were relatively most important in Pope and Independence Counties, but were represented by the largest numbers in Chicot County. Wage labor was relatively unimportant in the coastal-plain and upland counties, particularly in 1944. In the Delta Type Area, where cotton acreage worked by wage labor had been increasing during the 1932-38 period, the proportion worked by this type of labor began to decline about 1941, while that worked by share croppers increased correspondingly.

The total number of acres of cotton per 10,000 acres of cropland decreased in all counties except Mississippi, particularly during the latter part of the period when labor shortages were most acute. Corn acreage declined more than cotton. From 1939 to 1944 the number of tractors per 10,000 acres of cropland increased in the three delta counties from 15.2 to 29.3 in Chicot, 27.3 to 60 in Mississippi, and 21.4 to 37.2 in Pulaski. In 1944 there were five 4-row cultivators and four 4-row planters per 10,000 acres of cropland in the Delta Type Area. The number of work stock per 10,000 acres of cropland in the various counties ranged from 269 in Pope County to 395 in Chicot County.

On the basis of number of resident families in relation to cotton acreage, the amount of labor available per acre of cotton in the Delta Type Area in 1944 was only about 81 percent as high as in 1938. The number of resident families in re-

lation to cotton acreage and production on cotton farms will probably decline further when machinery, equipment, and labor are again freely available, with the acreage per cropper again declining. The proportion of share renters will decline further, while the proportion of wage laborers and combination wage laborers-croppers will increase. Present trends toward concentration of production in the delta and other areas best adapted to mechanized production are expected to continue, the rate depending largely on the degree to which economic forces are restricted by arbitrary controls.

Land ownership trends in North Dakota, selected years, 1929-1944. L. W. WALLIN and R. ENGELKING. (Coop. U. S. D. A.). (*North Dakota Sta. Bul.* 337 (1945), pp. 19, illus. 2).—Private land ownership in the nine selected counties decreased from 94.9 percent of the total land area in 1929 to 83.3 percent in 1941, then increased to 89.7 percent in 1944. Land owned by individuals amounted to 89.1 percent of the land area in 1929, 74.1 percent in 1941, and 86.7 percent in 1944. The peak of corporate ownership occurred about 1939. The acreage owned by corporations amounted to 5.8 percent in 1929, 9.2 percent in 1939, and 3 percent in 1944. Land ownership by commercial banks was highest in 1929, that of insurance companies in about 1939, the Federal land bank in about 1941, and that of other classes of corporations in 1934. The peak of county land ownership in the nine selected counties occurred about 1941, when the counties owned 6.7 percent of the land area, as compared with 0.5 percent in 1929 and 3.1 percent in 1944. The acreage of State school and endowment lands amounted to 3.8 percent of the land area in 1934, 4.8 percent in 1941, and 4.2 percent in 1944, and land owned by the Bank of North Dakota in these years 1.1, 3.4, and 1.2 percent. The acreage of Federal land ownership, including Indian land, for the State as a whole, decreased nearly 50 percent from 1929 to 1934, but was slightly higher in 1944 than in 1929. The percentage of public ownership for the whole State of North Dakota reached a low point in 1924 of 7.5 percent of the total land area. It increased to 21.1 percent by 1941, then decreased to 15.6 percent in 1944.

Washington Farm Security Administration borrowers weigh the future: A comparison of their views with those of large-scale operators. P. H. LANDIS (*Washington Sta. Bul.* 472 (1946), pp. 16).—Two samples were compared, one from 1,850 larger-than-average farms and the other, collected a year later, 450 Farm Security Administration borrowers who owned smaller-than-average farms.

The attitudes of the two samples toward problems of postwar planning were, for the most part, alike. On matters having to do with government activity in the field of national agricultural policy, public welfare, subsidized consumption, and medical care, the Farm Security group expressed more liberal attitudes. They also expressed more liberal views on the matters of tariff policy. On the matter of cooperatives, their views are more conservative, and they were also more negative toward the idea of part-time farming. The study of both groups indicated clearly that farmers from all economic levels are conscious of problems of health and medical care in their communities. Sentiment strongly favors some kind of cooperative approach to health insurance. Generally, farmers expect a depression within 10 yr. after the war. Most communities expect an increase in population, and more than a third expect a "back-to-the-land" movement that will affect their neighborhood. Generally, farmers are fairly optimistic about the ability of their neighborhood to offer employment to a substantial proportion of those who return to it from the war industries or from the armed forces. Considerable opinion favors government supervision and control of agriculture, and a substantial majority placed on

the National Government the responsibility for seeing that everyone has a job if private enterprise should fail to provide all with work.

Farm tenancy in the United States, 1940-1945: A list of references, A. M. HANNAY (*U. S. Dept. Agr., Libr. List 2, rev. (1946), pp. 84*).—This is a revised list of 546 references (*E. S. R.*, 87, p. 585).

Father and son farm agreements, R. T. BURDICK (*Colorado Sta. Bul. 491 (1946), pp. 15*).—Three types of agreements between father and son are presented.

Technique for classifying farm land for tax purposes, W. P. WALKER (*Maryland Sta. Bul. A42 (1946), pp. 155-170+, illus. 2*).—Acreages in land assessment classes were compared with acreages actually in land-use classes for 472 farms in 6 counties of Maryland. Considerable difference existed between the acreage assessed and the acreage used as tillable and pasture land for individual farms, based upon land use on farms under the U. S. D. A. Soil Conservation Service program. There was an average misplacement of 12 percent assessment due to failure to keep land assessment classes up to date. For nearly half of the farms the erroneous assessments amounted to 10 percent or more and averaged 22 percent. When the programs on such farms are completed, there will be a much greater difference between the assessment class acreages and land-use acreages. For the group of farms studied there were, on the average, about half as many assessment rates on arable land as there were distinct land capability grades. Most farms in Maryland have arable land of several distinct grades, and this fact justifies a wider range in assessment rates against arable land for individual farms than is commonly practiced in the State. Furthermore, greater emphasis could be placed upon land capability as one important factor in determining basic assessment rates, with additions or subtractions from such rates depending upon the use made of land or the type of woodland.

An economic study of local government in fifty Vermont towns, J. J. DALTON and S. W. WILLIAMS (*Vermont Sta. Bul. 532 (1946), pp. 48, illus. 10*).—This study of economic aspects of local government in Vermont was based upon detailed financial and related information covering the operations of 50 towns during the town fiscal year ending January 31, 1933.

State aid for roads and schools is an important item of town income, and town finances are considerably affected by the regulations that govern its apportionment. State aid for schools was available only to towns with school-tax rates of \$0.75 or more per \$100 of assessed valuation and poll taxes, and the amount these towns received varied directly with their school-tax rates. The rate of assessment varied from town to town and also within individual towns, the variation in the latter case reflecting chiefly a tendency to overappraise properties of low value in relation to those of high value. However, in any given price range, farms were assessed at a higher percentage of sale price than village properties. Nearly two-thirds of the town revenue was derived from taxes, and most of the remainder from State aid for roads and schools. Expenditures for roads and schools, which were approximately equal, together accounted for four-fifths of the total expense. Salaries and wages were major items in the cost of both roads and schools.

Differences in population per town apparently were not responsible for any large part of this spread in tax rates. The increase in population per town that was associated with a rise in the population per square mile, with no change in area, was accompanied by a decrease in costs, particularly highway expense. Taxes declined less than costs, however, because the amount of State aid decreased as the population per square mile increased. Tax rates were more

closely correlated with the amount of taxable wealth. Governmental costs, although fully as high in relation to the number of people, were much lower in relation to the sale value of the taxable real estate in the towns with comparatively large amounts of taxable wealth per person than in those with small amounts. Costs and taxes were lower in relation to property values in the towns that were best suited to farming than in the others, but they were not lower in relation to population.

Three measures of the tax burden on farms were used. Farm taxes were low in the towns in which the land was best suited to agriculture, in those having the smallest share of their road mileage in town roads, and in those in which the tax levy per person was comparatively small. They were slightly below average in the towns having the most people per mile of road and in those that operated elementary schools only. Farm taxes were low in relation to property values, though not in relation to the apparent income-producing capacity of the farms, in the towns with the most people per square mile and in those with the largest amounts of taxable wealth.

Income and expenses in growing and marketing Irish potatoes, Cumberland Plateau, 1943-1944, F. N. MASTERS and C. C. MANTLE (*Tennessee Sta., Agr. Econ. and Rural Sociol. Dept. Monog. 204* (1946), pp. 30+, illus. 11).—Potato yields of 111 bu. per acre returned farm operators about \$86 per acre above expenses compared with \$42 per acre above expenses reported by operators with potato yields from 56 to 110 bu. per acre, and a loss of \$33 per acre for operators reporting yields up to 55 bu. Certified potato seed averaged over 20 bu. per acre more than select or other potato seed. Those growers who used mechanical spraying machines found that the total expense of each application was about \$2.50 per acre. Potatoes harvested before August 1 had highest yields, highest prices, and highest returns per acre over expenses, in 1944. Price per bushel averaged highest for those potatoes marketed before August 1, and lowest for those marketed during the month of August. Highest price per bushel was obtained by growers reporting yields of over 100 bu. per acre and having better than average returns per acre over expenses. The average estimated residual value of commercial fertilizer per acre in 1944 was \$7.28, \$6.45, and \$6.38 in Cumberland, Morgan, and Sequatchie Counties, respectively. Farm operators with yields of 200 bu. of potatoes in 1943 reported incomes of \$250 per acre. Approximately 128, 96, and 81 man-hr. per acre of potatoes were required by the average high-, medium-, and low-yielding operators, respectively. Failures of producers to select good seed, carelessness in handling and packing, and strong marketing competition from other areas are some of the reasons for the precarious situation of many potato growers.

New Mexico vegetable production in relation to freight rates, P. W. COCKERILL (*New Mexico Bul. 329* (1946), pp. 17, illus. 1).—This report reviews the history of vegetable shipping from New Mexico and considers the factors which will effect future production, with special reference to transportation costs. It is designed not to cover the subject completely, but, rather, to emphasize the effect of inequities in freight rates.

It is noted that "the present period of high prices may be the last time for a considerable number of years in which New Mexico will have as favorable an opportunity to become established in vegetable production. To become established in this industry three things must be accomplished: (1) Production efficiency and skills must be developed; (2) a reputation for high quality products must be built up on the central markets; and (3) a large volume of production of each vegetable must be maintained every year in order to obtain the needed equalization of rates. If these three things are accomplished during

the present favorable period the industry will be in much better condition to weather a period of lower prices.

Readjustments in processing and marketing citrus fruits, H. L. COOK ET AL. (*U. S. Dept. Agr., Bur. Agr. Econ., 1946, pp. 190+*, *illus. over 25*).—This publication is one of several dealing with postwar readjustments in the marketing of agricultural products, prepared by or at the suggestion of the Working Group on Conversion of Marketing Facilities and Methods of the Interbureau Committee on Postwar Programs. The purpose of the study is to examine trends in production and prices and to evaluate outlets which may keep prices in line with costs. The inquiry into outlets includes an estimate of opportunities for increasing exports of citrus and citrus products, for improving the competitive position of fresh citrus marketed domestically by economies in marketing, and possibilities of expanding the processing outlet. Consideration of processing includes techniques and costs of production, and the competition faced by citrus products and byproducts.

More eggs produced per man hour, I. R. BIERLY and L. M. HURD. ([N. Y.] Cornell Expt. Sta.) (*Farm Res. [New York State and Cornell Stas.], 12 (1946), No. 3, p. 16, illus. 1*).—Two years ago a study comprising eight farms was initiated to determine why some farmers can care for more hens in a given amount of time than can others. On these farms, the time to care for 1,000 hens varied from 21 min. to 2 hr. a day; the distance traveled, from $\frac{1}{3}$ mile to $1\frac{1}{2}$ miles a day. Studies were made of the floor plans of the poultry houses, the kind of equipment used, the location of the equipment in the pens, and the way the work was organized.

It was found that one poultryman cut in half the manpower needed to care for his flock by taking out partitions so that he now has one large pen where formerly there were eight smaller ones. On some of the farms two or three jobs were accomplished during each trip with only two to four trips to each pen daily. Other farmers did one job at a time and made eight or nine trips, and the number varied from three to seven jobs on the farms studied. Automatic waterers eliminated one daily task on some farms. Some farmers supplied dry mash only once in 2 days, while some fed wet mash and pellets in addition to dry mash and grain. Cutting down on the time spent on the present flock through improved work methods may make it possible to care for more hens—and to produce more eggs per man hour.

Milk production costs in N. E. Mississippi, W. J. EDENS (*Miss. Farm Res. [Mississippi Sta.], 9 (1946), No. 3, p. 8*).—This progress report on the study started in 1944 includes data for that year as to total costs of production, profits, and labor returns from milk production; average annual production and cost of keeping a cow; and other data collected on 40 farms in north-eastern Mississippi.

Harvesting the hay crop, A. P. BRODELL, T. O. ENGBRETSON, and C. G. CARPENTER (*U. S. Dept. Agr., Bur. Agr. Econ., 1946, F. M. 57, pp. 22+*, *illus. 6*).—This report contains statistical information concerning haying methods and practices and is based largely on information obtained in 1945 by means of mailed questionnaires from about 20,000 crop correspondents.

Tobacco crop insurance in Tennessee, B. D. RASKOFF (*Tennessee Sta., Agr. Econ. and Rural Sociol. Dept. Monog. 202 (1946), pp. 29+*, *illus. 9*).—Tobacco trial crop insurance, offered tobacco growers in Maury and Greene Counties on the 1945 crop and carried on 1,376 farms, represented an average participation in the program by about 20 percent of the growers and 18 percent of the total tobacco acreage allotment. About 12 percent of all insured farmers had tobacco crop losses in 1945; on an acreage basis about 20 percent of the insured acreage

was indemnified in Greene County, and 53 percent in Maury County. Idemnities paid, as a percentage of premiums collected, averaged 31 percent in Greene and Maury Counties in 1945.

The average county yield in pounds of tobacco per acre varied from 975 to 1,530 in 1944. The average annual loss on 465 better tobacco farms in Tennessee, from 1935 to 1941, was 45 lb. per acre, and the percentage that annual loss is of average yield was 3.7.

It is concluded that farmers growing tobacco are likely to experience either a major or minor loss in 1 of 7 yr. The loss from unavoidable production hazards for the period 1934 to 1943 in Tennessee is estimated at 250 lb. per acre. Based upon the first 5 days of auction sales for the entire Burley area (43.4 ct. per pound), the insurance premium rate in Greene County in 1945 averaged \$23 and that in Maury County \$22.13 per acre. The premium rates in pounds per acre were 53 and 51, respectively.

The operations and management of 13 farmers' cooperatives in north Georgia, 1944. N. M. PENNY (*Georgia Sta. Bul.* 246 (1946), pp. 20, illus. 1).—This study brought out that the associations analyzed have volumes of business that are too low for most efficient operation, especially in marketing farm products, which is indicative of lack of proper support by the farmers of the area. A standardized method of bookkeeping and accounting and a fiscal year with the same ending should be adopted. The terminology and forms for financial statements for cooperatives approved by the American Institute of Cooperation are recommended. The organizations should own their own land, buildings, and facilities or have long-term leases in order to be divorced from the hazards of changes in use made of the facilities. The cooperatives should have greater leadership from the ranks of their members. A long-time objective of the educational program should be to become entirely independent of public agencies for leadership and to use those agencies only for advice, information, and consultation.

Relationships between cooperative organizations serving farmers in five Ohio counties. G. F. HENNING and L. B. MANN. (Coop. U. S. D. A.). (*Ohio Sta. Bul.* 660 (1946), pp. 43, illus. 2).—Conclusions reached from this study were as follows:

It should not be difficult to become a member of a cooperative, and nonmembers should be encouraged to join as a fundamental principle. The members are in favor of having some device whereby the nonmember who trades with the cooperative is made a member, as by applying the patronage dividends toward the share of stock, a membership fee, or whatever else may be the requirement. When an association uses capital stock, it should be of small units, probably \$5, \$10, or \$20 per share. If the organization needs more capital per member than what one share would furnish the association, it can require 2, 3, 4, 5, or more shares. The cooperative at certain periods should have a membership campaign and invite the young farmers, tenants, and others who have moved into the area to become members.

There was no general policy followed by the cooperatives considered in this study on eliminating the inactive members or the deadwood of the organizations. The time of returning the inactive member's investment in the cooperative (whether it be stock, retained savings, or reserves) should be left to the cooperatives, except that in the case of the death of a member the cooperative should return his equity or investment within 1 yr.

Savings should be distributed according to the broad principles of cooperation and sound business procedure as to patronage, with a distribution to all patrons contributing the volume of business rather than on a basis of investment. No dividend should be declared on retained capital, as this will help to keep down

the number of inactive members. Savings can be distributed by patronage in cash, issued stock, or accumulated toward the purchase of a share or certificate. Some cooperatives merely made allocations to their patrons on their books. If the cooperative is out of debt and has no desire to expand, then a large portion of the savings should be paid out in cash and only enough retained to place the cooperative in a strong financial position. A revolving plan is followed by some Ohio cooperatives; this system maintains the cooperative on a basis financed by the members who use it and reduces the interest of the inactive members in the cooperative.

Sales and consumer acceptance of certain dehydrated vegetables in Grand Rapids, Michigan, J. C. MOORE (*U. S. Dept. Agr., Farm Credit Admin., Misc. Rpt. 99* (1946), pp. 32+, *illus. 1*).—This report is concerned with the distribution of dehydrated vegetables through regular trade channels and the consumer acceptance of these items in Grand Rapids, Mich., under practical marketing conditions from March 6 to September 30, 1945. The products included were diced beets, carrots, sweetpotatoes, white potatoes, onion flakes, and julienne white potatoes. Approximately 18,000 cans of each of the 6 products were packaged in tin containers designed to hold 4 servings each. As a result of the initial efforts, sales averaged over 1,600 cans the first week. Sales gradually declined, however, for the next 8 weeks and then increased until a weekly volume of over 1,000 cans was reached. It is concluded that "dehydrators who contemplate selling their products through retail channels of distribution may expect to encounter considerable buying inertia on the part of retailers and consumers which can be overcome only by extensive and expensive advertising and promotion of acceptable products."

Housewives prefer prepackaged produce, C. W. HAUCK (*Ohio Sta. Bimo. Bul. 240* (1946), pp. 76-88, *illus. 8*).—Because of the trend toward prepackaging of foods in consumer units, the station has been exploring possibilities in this direction since 1945 in cooperation with one of the large corporate chain grocery companies operating in the State. The retail stores and warehouse of the company in Columbus have been serving as a laboratory for this purpose; in these supermarkets the produce departments have been equipped with open-top self-service type refrigerated sales and display cases, and these are kept stocked with consumer units of fresh fruits and vegetables, precooled, trimmed, and prepared in the central warehouse, packaged in paperboard trays or "boats" overwrapped in transparent sheet Cellophane. Most of the extra costs have been met by savings at various points, by extension of the "shelf life" of these perishables, and by increases in sales volume, without advancing the retail price of the packaged items over that of identical goods sold from bulk. Sources of savings include the elimination or reduction of waste, reduction of weight or bulk, and less labor because of self-service.

This new method of offering fresh fruits and vegetables has met very encouraging consumer acceptance, especially among those with 2, 3, or 4 persons in the family who furnished most of the patronage. In these groups 18 to 26 percent of the patrons wanted some items packaged in smaller consumer units.

The author concludes that if prepackaging of fresh fruits and vegetables is to be permanently successful it must be accompanied by exacting care at all points in the grading and packaging operations, constant effort to maintain a high standard of quality and freshness, rapid turnover, and a sincere readiness to replace any unsatisfactory purchase with good merchandise or to refund the purchase price.

Index numbers of production, prices, and income, J. I. FALCONER (*Ohio Sta. Bimo. Buls. 240* (1946), p. 92; *241* (1946), p. 114).—In Bulletin 240 the table

of index numbers is brought up through February and in Bulletin 241 through April 1946.

Statistics pertaining to the 1946 demand situation for canning peaches, H. R. WELLMAN and B. H. SCHULTE (*California Sta. Mimeog. Rpt. 87 (1946), pp. [21]*).—There are 24 tables, but no discussion.

RURAL SOCIOLOGY

Review of current research in rural sociology, R. M. WILLIAMS, JR. (Cornell Univ.). (*Rural Sociol., 11 (1946), No. 2, pp. 103-114; Span. abs., p. 103*).—This report outlines six criteria for appraising rural sociological research: (1) Methodology; (2) scientific importance; (3) social importance; (4) effectiveness of presentation; (5) economy of investigation; (6) adherence to the norms of "good scholarship." Discussion is limited to the first four criteria.

[**Dwight Sanderson Memorial Number**] (*Rural Sociol., 11 (1946), No. 1, pp. 90, illus. 1*).—In this issue the following papers are included: Dwight Sanderson—Rural Social Builder, by W. A. Anderson (pp. 7-14) (Cornell Univ.); Dwight Sanderson—Social Scientist, by C. C. Taylor (pp. 14-23) (U. S. D. A.); Group Classification—Dwight Sanderson's Contribution, by H. W. Beers and J. H. Kolb (pp. 23-35) (Ky. and Wis. Univs.); The Family, by R. G. Foster (pp. 35-42); and The Concept of the Community, by D. Ensminger and R. A. Polson (pp. 43-51) (U. S. D. A. and Cornell Univ.).

Some effects of the war on rural life in Missouri, 1939-1945, G. SCHULTZ (*Missouri Sta. Res. Bul. 401 (1946), pp. 36, illus. 5*).—The author finds that the response of the rural population to the requirements of national defense was wholly satisfying and in complete accord with the traditional patriotism of the farm people of the United States. The alacrity and success with which farmers shifted and directed their efforts to meet the demands of wartime production amply demonstrated their adaptability and the flexibility of American rural economic and social organization. The exceptionally heavy losses of population through entrance into the armed forces and migration to war industries stands as one of the most significant effects of the war upon rural Missouri. A significant effect of the war has been the marked increase in rural community contacts with the outside world, both at home and abroad. The abundant news, by press and radio, covering significant war events throughout the world—events that involved local boys—kept rural people news conscious. Furthermore, wartime government agencies settled their controls upon the rural communities and regulated daily affairs in such a way that rural people could scarcely fail to be impressed by their close relation to the national whole. Another outstanding effect of the war was the increased prosperity it brought to rural Missouri. Debts were paid, inventories were improved, and, with opportunities for spending curtailed, some money accumulated. The scarcity of consumption goods prevented much improvement in mode of living. Indeed, housing, farm buildings, conveniences, and much equipment tended to deteriorate for lack of replacements. On the whole, rural life was not seriously disrupted by the war. There were fewer people on farms and they worked harder. Rural organizations did not appear to suffer. There seems to have been some increase in local cooperative effort, chiefly by way of mutual aid. No social or cultural upheaval occurred. Rural Missouri "took the war in stride." Perhaps the most profound effects have been registered in terms of changes in attitudes, outlook, and habits of thinking.

The challenge of tomorrow's rural life, W. A. ANDERSON. (Cornell Univ.). (*Rural Sociol., 11 (1946), No. 2, pp. 120-127; Span. abs., p. 120*).—Extraordinary population changes presage the urbanization of rural areas, the elimination of

most distinctions between urban and rural, and the building of the mechanized rural community. This has come about as a result of the revolution in transportation, especially the automobile and paved road; the changes in communications; the commercialization and mechanization of farming; the mechanization of the rural home; and changes in rural social institutions, especially in the school and in government.

Rural life promises much for the future, W. A. ANDERSON. ([N. Y.] Cornell Expt. Sta.). (*Farm Res. [New York State and Cornell Stas.]*, 12 (1946), No. 3, pp. 4-5).—A discussion similar to the above from which the author concludes that a major problem of tomorrow's rural life is the achievement of a constructive integration of urban and rural viewpoints.

An Iowa locality, 1918-1946, B. L. MELVIN (*Rural Sociol.*, 11 (1946), No. 2, pp. 115-119; *Span. abs.*, p. 115).—In 1918 Savannah, a small hamlet in southeast Iowa, was the partial service center of the locality consisting of two county school districts. The community activities gravitated around the store, the church, the community house, and two rural schools. In mechanization the automobile was displacing the horse and buggy, but now farming is done with tractors, two- and three-bottom plows, combines, corn huskers, etc. Activities have shifted to the county seat, which is connected with Savannah by a gravel road and an electric line. The county agricultural agent, the home demonstration agent, the director of rural electrification, the representative of the Agricultural Adjustment Administration, and a soil technologist serve agriculture from the county seat, and trained veterinarian looks after the hogs, sheep, and cattle from the same center, but the people are not served therefrom in the fields of education, health, or religion. It is concluded that the State college and the Federal Government are doing an excellent job of caring for agriculture but not for the farmer and his family.

Differential fertility in Louisiana, J. A. BEEGLE and T. L. SMITH (*Louisiana Sta. Bul.* 403 (1946), pp. 44, illus. 21).—According to this study, largely an analysis of reproduction rates in 1940 based on the sixteenth U. S. Census, the rate of reproduction in Louisiana is still considerably above that necessary to replenish the population, but the relative importance of the basic stocks in the population is changing very rapidly. In proportion to population, the farm people of the State are producing more than two children for every one borne by the city people. "The State faces no greater problems than those of seeing that opportunities for healthful living, education, and the costs of rearing the oncoming generation are more equitably distributed among all its people." Contrary to popular belief, Negroes in Louisiana do not have a birth rate far above that of the white population. Farm Negroes are reproducing more rapidly than the whites who live on farms, but, on the other hand, urban Negroes are less prolific than urban whites. The population of French-Catholic south Louisiana is multiplying far more rapidly than that of Anglo-Saxon, Protestant north Louisiana. In common with the other Southern States, Louisiana is contributing a disproportionately large share of the Nation's future population. In comparison with most of the other States the rates of reproduction of Louisiana farm and rural-nonfarm population are very high; however, the birth rate of urban people in the State compares very closely with urban birth rates elsewhere in the Nation. Nevertheless, for at least 60 yr. Louisiana's rate of reproduction has been falling steadily.

Rural and urban residence of the Negro in the United States, S. C. MAYO. ([N. C. Stat. Col.]. (*Rural Sociol.*, 10 (1945), No. 1, pp. 10-16, illus. 1; *Span. abs.*, p. 10).—The Negro in America has for long been thought of as a typical rural dwellers but, as measured by residence, on a proportionate basis he is

more urbanized than the white population. In North Carolina a larger proportion of the total Negro than the white population has been in urban centers for the past 120 yr. Also in all six of the major regions of the United States in 1940 a greater proportion of the Negro population was in urban centers, and this appears to be the continuation of a long-time trend. By comparing the proportion of the various total population classes in urban centers in 1920 and 1940 it is revealed that the Negro is becoming urbanized at a much faster rate than other racial and nationality groups in the United States.

Kansas rural institutions.—II, A pioneer in rural electrification, F. D. FARRELL (*Kansas Sta. Cir.* 236 (1946), pp. 23, illus. 7).—This is a discussion of an instance in which members of a small rural community have had throughout a quarter century an efficient and constantly improving rural electrification service through the operations of a farmers' cooperative association. The operations of this association, located at Berwick in the northeastern corner of Nemaha County, Kans., are described.

Prepayment medical care in Nevada County, Arkansas, T. L. VAUGHAN and H. PRYOR. (U. S. D. A.). (*Rural Sociol.*, 11 (1946), No. 2, pp. 137-147, illus. 1; *Span. abs.*, pp. 137-138).—Farmers in this country organized their own cooperative health association in 1942 in an effort to provide themselves with essential medical care at a price which they could afford to pay. The program was one of seven sponsored and partly financed by the U. S. Department of Agriculture to determine feasible means of extending medical care in rural areas. Herein is a report on operations of the Nevada association during the 1942-43 and 1943-44 fiscal years. Prepayment of membership fees coupled with grants-in-aid went far in eliminating the economic barrier to medical services, but all groups did not take full advantage of services. Strong and weak points of the health service are summarized, with the conclusion that the Nevada plan is a step toward, but not a complete answer for, adequate medical care for rural people.

The Wheeler County, Texas, Rural Health Services Association, M. T. MATTHEWS. (U. S. D. A.). (*Rural Sociol.*, 11 (1946), No. 2, pp. 128-137; *Span. abs.*, p. 128).—This study of this project indicated that prepayment medicine was not new to Wheeler County people. Local attitudes regarding Federal participation in health programs grew out of general and local crises which resulted in adjustments of older ideologies relating to such aspects of health care as minimum service standards and personal or group responsibilities. Unusual conditions surrounding program operation resulted in some decline of membership, but high program approval and morale were indicated by several indexes. Numerous improvements were suggested, many of which related to increased service coverage at somewhat lower costs with better access to the metropolitan type of clinical facilities.

AGRICULTURAL AND HOME ECONOMICS EDUCATION

Workers in subjects pertaining to agriculture in land-grant colleges and experiment stations, 1945-46, B. T. RICHARDSON (U. S. Dept. Agr., *Misc. Pub.* 603 (1946), pp. 164+).—This is the usual annual list (E. S. R., 93, p. 383) of workers in agriculture and home economics in the land-grant colleges and experiment stations, the personnel of the Office of Experiment Stations, and the officers and standing and special committees of the Association of Land-Grant Colleges and Universities.

Rural-urban differences in the educational status of Louisiana's white population, T. L. SMITH and L. KEMP (*La. Rural Econ. [La. State Univ.]*, 8 (1946), No. 2, pp. 4-6, illus. 2).—In the United States farmers receive much

less formal schooling than the people who live in towns and cities. This unfavorable differential is greatest in the South, and the situation is particularly acute in Louisiana where adult white people living on farms have had only two-thirds as much formal schooling as their fellows who live in incorporated towns and cities.

Rural education and welfare in the Middle East, H. B. ALLEN (*London: Govt., 1946, pp. 24+*, *illus. 1*).—This is a report by the Director of Education of the Near East Foundation to the Director General of the Middle East Supply Centre. It deals with the rural situation in the Middle East and the role of education in meeting the problems confronted.

FOODS—HUMAN NUTRITION

The new flour: Baking qualities, M. T. SWICKARD. (U. S. D. A.). (*Jour. Home Econ., 38 (1946), No. 6, pp. 353-354*).—All-purpose and cake flours available at the time of the War Food order were used for controls in determining the baking qualities of 80 percent extraction flour. Those used in the tests included flours milled from hard and soft wheat. The 80 percent extraction flours, except one soft wheat, weighed slightly less per unit of volume than did the control flours, indicating that the batters and doughs would be softer and adjustments in measurements necessary.

Biscuit doughs were soft and difficult to handle when the 80 percent extraction flours were used measure for measure, although three of the four test doughs so made gave excellent biscuits. The best biscuits made with the hard wheat were produced by using the same measure of flour and liquid as in standard recipes. Griddle cakes, pastry, and cakes were found to be sticky in texture when the soft wheat was used in the same proportions in standard recipes; better results were obtained when the hard wheat flour was used in standard proportions and the liquid was not readjusted. In general, the results of the test bakings showed that the products made from the new flour were more tender and moist than those made from the control flours.

To enrich or not to enrich: A symposium, E. V. MCCOLLUM, R. M. WILDER, A. F. MORGAN, and H. S. MITCHELL. (Univ. Calif. et al.). (*Jour. Home Econ., 37 (1945), No. 7, pp. 397-402*).—This symposium deals with mandatory enrichment of white flour and bread.

Enrichment of corn meal and grits (*South Carolina Sta. Rpt. 1945, pp. 72-75, illus. 2*).—Experimental premixes of desired composition were prepared and tested, and small machines were designed (diagrammatical drawings given) for feeding the premix into the meal and grits as they were ground. These feeders are being used in 130 corn mills in South Carolina to bring corn products up to the nutritional standards recommended by the Nutrition Board of the National Research Council.

Effect of method of combining the ingredients upon the quality of the finished cake, G. L. TINKLIN and G. E. VAIL. (Kans. Expt. Sta.). (*Cereal Chem., 23 (1946), No. 2, pp. 155-165*).—Investigations made on the effect of different methods of combining the ingredients of a simple cake upon the characteristics of the batters and the baked product are reported. The consistency and the specific gravity of cake batters prepared by six general methods of mixing were determined and relative shortness, compressibility, and eating quality of the finished cakes were evaluated approximately 20 hr. after baking.

Batters with a wide range in consistencies were found when the ingredients were combined by varying methods. Each method tended to give a characteristic batter, ranging from the thinnest, which took 0.2 min. to flow through a 5.0 cm.

stemmed funnel, to 52.8 min. for the thickest. Consistency and specific gravity were found to be closely related, indicating that the amount of air incorporated in the batter may be an important factor in determining its consistency. Specific gravity ranged from 0.7368 to 1.0351 for the individual cakes and from 0.7509 to 1.0298 for the different methods employed. Cakes of low specific gravity tended to give cakes of good volume which were evaluated as tender and compressible.

Cakes mixed for a short period had a coarse, loose, porous texture, but those methods requiring the most time did not necessarily give the best results. Significant correlations were found between shortness and compressibility, with specific gravity, and with palatability.

Does nitrogen affect pea quality? C. B. SAYRE. (N. Y. State Expt. Sta.). (*Food Packer* 27 (1946), No. 5, pp. 68, 70-71, illus. 2).—Essentially noted from another source (E. S. R., 95, p. 330).

Shelf life of fresh fruits and vegetables can be lengthened, C. M. HAUCK (*Ohio Sta. Bmo. Bul.* 241 (1946), pp. 100-103, illus. 1).—The factors affecting shelf life are discussed, and tests of the advantages of prepackaging with cellophane and refrigeration are reported with 14 root crops, green and leafy vegetables, and citrus and deciduous fruits. Packing and refrigeration together produced results much better than either alone, although not uniformly effective on all commodities tested. The importance of initial handling is also emphasized.

Storage of pork products (*South Carolina Sta. Rpt.* 1945, pp. 67-68).—Experimental data are presented on the effect of temperature and storage methods on sausage, cured hams, and bacon. Uniform methods were used in cutting, curing, and smoking the hams and bacons. After smoking, the samples were stored at room temperature and at 36° F. in refined cottonseed oil, raw cottonseed oil, and in cotton sacks. Bacon samples stored without the use of oil were given the same score after 40 weeks of storage whether stored at room temperature or at 36°, but samples stored in raw or refined oil at 36° were given a perfect score at the end of 48 weeks whereas those stored at room temperature did not grade above moderately desirable at any test date. Up to 32 weeks of storage, hams kept without oil at room temperature or at 36° were found to be desirable in quality. Those kept in oil at room temperature showed a gradual decline in quality after the first 8 weeks and were classified as only slightly desirable after 48 weeks; at 36° there was some decline in quality after 16 weeks of storage. Raw oil was the more desirable storage medium at 36°, while refined oil gave best results at room temperature.

Sausage stored in open containers and covered with lard, refined oil, or raw oil deteriorated in quality after the first test period of storage at 8 weeks. Sausage which was processed and sealed in tin or glass showed a slight decline in quality but was graded moderately desirable at the end of the test. Frozen sausage lost quality and flavor as the storage period progressed.

Dehydration of vegetables and fruits (*Florida Sta. Rpt.* 1945, pp. 81-82).—A. L. Stahl and F. S. Jamison, report that cabbage, beans, collards, broccoli, and carrots from eight widely separated locations in Florida and additional samples from plots of three fertilizer levels at these locations were dehydrated under various conditions. Fertilizer level had no apparent effect on the dehydrated vegetables, but the best products were obtained from those locations, notably those with muck soils, producing good succulent growth. From one-third to one-half of the original ascorbic acid was lost even in the best controlled dehydration of the vegetables, and another one-fifth to one-third was lost in cooking after dehydration. Ascorbic acid content was highest in the products stored under refrigeration in the dark in moisture—and air-proof containers. New dehydrated products included dehydrated celery and spinach powders, prepared

from vegetables and fruit wastes. A satisfactory boiled dehydrated peanut was prepared.

Nutrition Foundation investigation on nutritive value, oxidative enzymes, and other factors in certain commercially dehydrated vegetables, L. A. MAYNARD, W. L. NELSON, W. A. GORTNER, J. M. NELSON, C. R. DAWSON, and M. F. MALLETT (*Ithaca, N. Y.: Cornell Univ., School Nutr.: New York: Columbia Univ., 1946, pp. 16+*).—This mimeographed report deals with the investigation of the causes of the rapid deterioration of the dehydrated products purchased by the armed forces. Commercially dehydrated cabbage, potatoes, and sweetpotatoes were placed in controlled storage for 1 yr. under experimental conditions of temperature and moisture. Control, blanched, and dehydrated samples were assayed for vitamin, oxidative enzymes, "available" iron, total copper, and moisture content.

The dehydrated cabbage and potato samples showed extensive and rapid storage deterioration as evidenced by loss of vitamin C, discoloration, and off-odors under storage conditions of 70° to 80° F. and 7 percent moisture. Lower storage temperatures kept products more stable. Correlation between this deterioration and oxidative enzyme, copper, and iron contents were not evident. All the vitamins assayed except ascorbic acid were found to be fairly stable during the controlled storage. Sulfite blanching reduced the ascorbic acid losses in the cabbage after storage periods, but thiamine was destroyed.

"The data refute the view that the storage deterioration of commercially dehydrated cabbage and potatoes may be due to the action of oxidative enzymes whose presence might arise from inadequate blanching or regeneration during storage."

Commercially dehydrated vegetables: Oxidative enzymes, vitamin content, and other factors, M. F. MALLETT, C. R. DAWSON, W. L. NELSON, and W. A. GORTNER. (Cornell Univ. et al.). (*Indus. and Engin. Chem., 38 (1946), No. 4, pp. 437-441*).—Essentially noted above.

Some changes which occur in the carbohydrates of sweetpotatoes when they are dehydrated, blanched and dehydrated, or baked (*South Carolina Sta. Rpt. 1945, pp. 68-69*).—Moisture, dextrose, sucrose, and starch were determined in sweetpotatoes prepared primarily for livestock feed by (1) slicing and dehydrating at 70° C.; (2) slicing, blanching in steam at 15 lb. pressure for 30 min., followed by dehydrating at 70°; and (3) baking whole for 1 hr. at 150°. The data presented indicate that "the greatest changes in composition occurred when the sweetpotatoes were blanched or when they were baked. The principal change was a reduction in the starch content and an increase in the quantity of reducing sugars. The sucrose content was not affected to any considerable extent. There was a large loss of starch, particularly in the case of the 'blanched and dehydrated' sweetpotatoes which is not accounted for, but which may consist of dextrins. The baked sweetpotatoes lost about 25 percent of their weight during baking." The dehydrated sweetpotatoes contained 141γ and the blanched and dehydrated product 82.5γ of carotene per gram.

Storage of dried fruit: Influence of moisture and sulfur dioxide on deterioration of apricots, E. R. STADTMAN, H. A. BARKER, E. M. MRAK, and G. MACKINNEY. (Univ. Calif.). (*Indus. and Engin. Chem., 38 (1946), No. 1, pp. 99-104, illus. 6*).—This paper is concerned with the development of quantitative methods for studying the rate of deterioration and the storage life of dried fruit. A colorimetric procedure, involving a visual comparison of 50 percent alcoholic extracts with standardized reference solutions, was developed for determining the relative degree of darkness of dried fruit samples. By this method, the storage life of dried apricots was determined as a function of the SO₂ level and the moisture content.

The influence of moisture on the rate of deterioration of apricots with moisture contents greater than 10 percent was found dependent upon the quantity of oxygen available to the fruit. Increasing the moisture content from 10 to 25 percent caused a 15 to 30 percent increase in the storage life when apricots were kept at 49° C. in an oxygen-free atmosphere. Further increases in storage life were noted when high levels of SO₂ (up to 25,000 p. p. m.) were used, although it did not prevent deterioration. During storage at moderate or high temperatures, the SO₂ content of apricots steadily declined until approximately 65 percent of the initial application was lost, showing that the effect of SO₂ is independent of moisture and temperature between 36.7° and 49°.

Storage of dried fruit: Gas changes during storage of dried apricots and influence of oxygen on rate of deterioration, E. R. STADTMAN, H. A. BARKER, V. HAAS, E. M. MRÁK, and G. MACKINNEY. (Univ. Calif.). (*Indus. and Engin. Chem.*, 38 (1946), No. 3, pp. 324-329, illus. 6).—"The rate of oxygen consumption is greatly increased by increasing the moisture content over the range 10 to 25 percent, by increasing the partial pressure of oxygen, and by increasing the temperature of storage. Although the rate is completely independent of the sulfur dioxide concentration, 30 to 45 percent of the oxygen consumed is utilized in oxidation of sulfur dioxide to sulfate. At temperatures below 43° C. the shortening of the storage life in the presence of oxygen appears to be due entirely to a lowering of the sulfur dioxide level by oxidation. Under anaerobic conditions carbon dioxide is produced by a nonenzymatic process at a rate which is generally correlated with the rate of darkening. The presence of oxygen increases the rate of carbon dioxide production in relation to darkening. Carbon dioxide formation results in the development of 'swells' in cans of dried fruit which are hermetically sealed. The rate of pressure development varies with the tightness of the pack, the sulfur dioxide concentration, and the moisture content. The development of swells is not observed during the edible storage life of the fruit if the ratio of oxygen to fruit in the cans is sufficiently high or if the fruit is canned in vacuum."

Storage of dried fruit: Influence of temperature on deterioration of apricots, E. R. STADTMAN, H. A. BARKER, V. HAAS, and E. M. MRÁK. (Univ. Calif.). (*Indus. and Engin. Chem.*, 38 (1946), No. 5, pp. 541-543, illus. 6).—Further experimentation (see above) with the deterioration of dried apricots during storage was made regarding the influence of temperature on the rates of darkening, sulfur dioxide disappearance, carbon dioxide production, and oxygen consumption. The results indicated the undesirability of using high temperatures (60° to 70° C.) to dry fruit to moisture levels below 25 percent. Fruit of lower moisture content should have a final drying period at low temperatures (25° to 40°).

Dehydrofreezing: New way of preserving food, L. B. HOWARD and H. CAMPBELL. (U. S. D. A.). (*Food Indus.*, 18 (1946), No. 5, pp. 88-90, illus. 3).—A brief discussion is given of the procedure for combining the space and weight advantage of dehydrated products and the fresh-quality retention of frozen ones through partial dehydration followed by freezing storage. Data are summarized for peas, carrots, asparagus, cherries, boysenberries, apricots, and potatoes.

Frozen foods, J. H. CLARK (*New Jersey Stas. Cir.* 500 (1945), pp. 23, illus. 7).—This publication, which supersedes Circular 461 (E. S. R., 80, p. 604), describes and illustrates home freezing cabinets, including the walk-in type, homemade cabinets, holding cabinets, and other types of freezing equipment. Experiments are noted which show that the sugar not only adds sweetness but preserves the fresh-fruit flavor of most fruits, and that ascorbic acid is very effective in

improving the quality and appearance of frozen peaches. The amount of ascorbic acid recommended is 150 mg. dissolved in three-fourths of a cup of sirup, or enough to cover the fruit in a 1-lb. package. A table gives ratings of fruit varieties as to their adaptability for freezing. There is also information on temperatures, packaging, and preparation for freezing of vegetables, poultry, cooked foods, eggs, rabbits and other small game, meat products, and fish and shellfish.

Freeze-drying holds promise, J. C. MOYER and E. STOTZ. (N. Y. State Expt. Sta.). (*Food Packer*, 27 (1946), No. 4, pp. 42, 44, illus. 1).—Essentially noted from another source (E. S. R., 94, p. 831).

Precooked frozen foods are boon to housewife: Home freezing of pre-cooked foods prevents waste and provides constant source of nutritious flavorful meals—short serving time between freezer and table important, F. FENTON. ([N. Y.] Cornell Expt. Sta.). (*Farm Recs.* [N. Y. State and Cornell Stas.], 12 (1946), No. 3, p. 13).—A list of 11 precautions are noted for obtaining successful frozen cooked products. These points are based on experimentation reported earlier (E. S. R., 95, p. 589).

Freezing foods for home use, S. KALOGEREAS (*Louisiana Sta. Bul.* 404 (1946), pp. 16, illus. 3).—This bulletin considers the basic principles of preservation by freezing, including a list of products suitable for freezing, freezing methods, suitable containers, preparation procedures, and directions for thawing and cooking of frozen foods.

Problems in freezing cooked foods, J. G. WOODROOF. (Ga. Expt. Sta.). (*Quick Frozen Foods*, 8 (1946), No. 9, pp. 90-91, illus. 3).—Major problems in the complexity of freezing precooked foods discussed here include the separation of fats in gravies, stews, and sauces; precipitation of certain proteins, such as egg whites, starch breakdowns, as in spaghetti and potatoes; and loss of fresh flavor and aroma due to oxidation.

Moisture losses of vegetables during steaming, quick freezing, and packaging, J. E. NICHOLAS, G. OLSON, G. V. STARR, and T. U. CONES. (Pa. Expt. Sta.). (*Agr. Engin.*, 27 (1946), No. 6, pp. 263-268, illus. 4).—This study, conducted to determine whether moisture losses in products frozen before packaging were small enough to warrant recommending this type of freezing, included tests on carrots, green beans, broccoli, peas, asparagus, beets, and spinach. Percentage moisture variations were determined after steaming and after freezing, and total percentage moisture variations were calculated, ranging from an average of 20.27 percent loss in spinach to an average 1.40 percent gain in broccoli. Unpackaged products froze from approximately 9 to 13 times faster on plate at -0.5° F. and 23 to 53 times faster in an air blast at -9.3° than packaged products at approximately equal temperatures.

"It was concluded that the method of freezing products before packaging may be recommended for carrots, green beans, broccoli, peas, asparagus, and beets because of the relatively small moisture losses and the great reduction in the time required for freezing. This method was not found satisfactory for spinach because of the difficulty in packaging the frozen product. The high percentage loss for spinach was, however, in steaming and chilling and not in freezing."

Effect of freezing rate on vegetables: Appearance, palatability, and vitamin content of peas and snap beans, F. A. LEE, W. A. GORTNER, and J. WHITCOMBE. (N. Y. State Expt. Sta. and Cornell Univ.). (*Indus. and Engin. Chem.*, 38 (1946), No. 3, pp. 341-346, illus. 4).—Five different rates of freezing were employed, ranging from very rapid (by means of liquid air) to very slow (in an insulated box), to study the effects of freezing rates on the quality of vegetables. Peas and snap beans were blanched, frozen, and stored at -6° F.

for 6 mo. Analyses were made (on raw, blanched, and frozen samples after 6 months' storage and after cooking) for ascorbic acid, carotene, and thiamine, with riboflavin being run on peas only. Significant differences in vitamin content were not found from the rates for freezing studied, nor were differences in taste and texture observed with the exception of those frozen in liquid air, which were somewhat softer in texture. Photomicrographs showed that the slower the rate of freezing, the larger the ice crystals; but in the corresponding thawed samples, these differences disappeared and damage was not apparent.

Home freezing of popular vegetables: Lima beans, corn on the cob, green soybeans are general favorites—maturity important factor in insuring satisfactory results, F. A. LEE. (N. Y. State. Expt. Sta.). (*Farm Res. [N. Y. State and Cornell Stas.]*, 12 (1946), No. 3, pp. 2, 3, illus. 1).—Suggestions are included for freezing suitable varieties of corn on the cob, lima beans, and green soybeans. Scalding periods according to size of the ears are recommended for corn on the cob.

Freezing of California fruits—apricots, L. HOHL and J. SWANBURG. (Univ. Calif.). (*Food Packer*, 27 (1946), No. 4, pp. 37–38, 68, 70, 72, illus. 1).—Commercial procedures and experimental studies on the processing of apricots for freezing are described. The advantages and disadvantages of each method are enumerated and recommendations are made on the basis of the findings. Steam blanching for a sufficient period of time to inactivate the enzymes, followed by cooking, yielded good results, although sirup blanching was theoretically favorable. Dipping apricots into SO₂ or sodium bisulfite solution containing SO₂ (4,000 p. p. m.) for 4 min. was found to give satisfactory results for fruit frozen in halves. Fruit treated in this manner was found to have an SO₂ content of 50 to 75 p. p. m.

The best results with the use of ascorbic acid as an antioxidant were achieved by using equal weights of fruit and 40° Brix sirup containing 0.1 percent ascorbic acid. Apricots packed in sufficient sugar sirup to cover the fruit required a minimum of antioxidant to retain good color.

Preparation of apricot puree consisted of steam blanching the whole or halved fruit for a minimum time for enzyme inactivations, cooling in air, pitting, and sieving through a 0.04-in. screen in a tomato juicer.

Tests prove best methods of citrus heart freezing, A. L. STAHL. (Fla. Expt. Sta.). (*Quick Frozen Foods*, 8 (1946), Nos. 6, p. 59; 7, p. 94).—Silver Cluster, Duncan, Excelsior, Florida common, Marsh Seedless, and Thompson Pink varieties of grapefruit were tested for their value in freezing and were found to be satisfactory in the order named. The effects of the methods of preparation on the frozen product were studied, and the best samples were obtained using precooled fruit (without the use of lye or hot water) and peeled either mechanically or by hand, then immediately subjected to a slight vacuum, broken with CO₂ gas just before packaging. Sugar sirups produced better results than dry pack. Denaturation proved to be advantageous, as did the use of ascorbic acid as an antioxidant. Results indicated that a storage temperature around 0° F. was preferable to others tested. The glass cup and tin can were found to be more effective than other types of packaging because of their ability to hold the fruit in vacuum. Oranges, tangerines, and mixed orange and grapefruit packs were also found to be satisfactory when treated with the above procedure.

Freezing experiments on strawberries, E. A. FIEGER, C. W. DUBOIS, and S. KALOGEREAS. (La. Expt. Sta.). (*Fruit Prod. Jour. and Amer. Food Mfr.*, 25 (1946), No. 10, pp. 297–301, illus. 1).—"Experiments on freezing strawberries with various amounts of dry sugar and sugar sirup were conducted in connection with various treatments of the fruit and methods of freezing. Chemical, physical,

and organoleptic examinations were made on the samples after 16 to 19 months' storage at 0° F.

"Slicing of strawberries facilitated absorption of sugar, resulting in better retention of flavor during the storage period. The addition of dry sugar gave a much better product than the use of sugar sirup. Addition of sugar has no effect on retention of color of strawberries when frozen and stored at 0°. Delayed freezing after addition of dry sugar resulted in a poorer product than those which were frozen immediately after adding the sugar. The best proportions of sugar to strawberries by weight lay between 1 : 4 and 1 : 5 depending on the preference of the individual."

Frozen blueberries: Home processing and use, M. E. KIRKPATRICK. (U. S. D. A.). (*Jour. Home Econ.*, 38 (1946), No. 5, pp. 291-292).—Cultivated blueberries of the Scammell and Jersev varieties, as well as some seedlings, were frozen whole for dessert use; others were made into puree and frozen. Part of the whole berries were packed without pretreatment and after evaluation were found to have a more natural fresh flavor than the berries which were scalded in steam for 1 min. before freezing. Sugar sirup or dry sugar packed blueberries had qualities of freshness superior to those frozen without sugar. Preliminary scalding was found unnecessary for berries made into puree, and fresh flavor was maintained over a storage period of several months if they were sweetened before freezing.

Investigations on the freezing storage of figs, H. M. REED. (Tex. Expt. Sta.). (*Quick Frozen Foods*, 8 (1946), No. 7, pp. 84-85).—Investigations were made to study the possibility of freezing ripe unpeeled Magnolia figs and the effect of blanching in steam at atmospheric pressure on their keeping quality. Comparative quality ratings were made with other varieties, and Royal Vineyard, Dr. Hoggs Clare, and Revolver figs gave good quality frozen packs. The peeled Magnolia figs were better in appearance and flavor and were less desirable in texture than blanched or unbalanced unpeeled figs. Blanching for 1.5 min. or longer tended to decrease the flavor. There was a loss in the average quality rating of the Magnolia figs as the time of storage increased, with the greater loss occurring after 6 months of storage.

Testing the sealing qualities of jar rings, E. H. DAWSON, J. A. LORR, and D. E. SHANK. (U. S. D. A.). (*Jour. Home Econ.*, 38 (1946), No. 5, pp. 287-290).—Methods were developed to determine the sealing performance of jar rings under home canning conditions. Two tests for leakage were employed, one being based on the reaction between barium hydroxide solution within the jars and tannic acid solution in the cooling, and the other on spoilage in a food mixture within the jars after immersion in an inoculated bath. Jar rings of identical composition showed less vacuum with the shoulder-seal jars than the top-seal types, ranging from 24 to 26 in. The sealing quality of the jar rings of different composition was determined, and under the conditions of the barium chloride tannic acid test the shoulder type seal resulted in a larger number of "leakers" than did the top seal. Bacteriological tests of the gasket performance showed a few failures with use of jar rings of the top-seal type and a larger number with the shoulder-seal ring.

Canned vegetable soybeans. Chemical and nutritional studies, A. KRAMER, C. H. MAHONEY, E. STEPHENSON, and A. L. MARKS. (Md. Expt. Sta.). (*Food Packer*, 27 (1946), No. 5, pp. 47-48, 50, 52, illus. 2).—Essentially noted elsewhere (E. S. R., 94, p. 533).

A comparison of some tomato varieties for preserve making, C. W. CULPEPPER, J. S. CALDWELL, and M. C. HUTCHINS. (U. S. D. A.). (*Fruit Prod. Jour. and Amer. Food Mfr.*, 25 (1946), Nos. 9, pp. 263-267, 269; 10 pp. 302-305,

509, 314-315).—Preserves employed in the varietal comparisons were made by mixing 60 parts of fruit and 40 parts sugar, and concentrating to a solid content of 68 percent. The products were sealed into glass containers while hot and stored in darkness at 70° F. for 6 mo. At the end of this time, colors of all samples were determined by matching with the Maerz and Paul color standards; consistency or viscosity measured by means of a penetrometer or consistometer; and scores made for flavor, texture, and comparative desirability.

The varieties ranking highest in comparative desirability were Principe Borghese, San Marzano, Red Pear, three strains of Yellow Plum, Rutgers, and Hybrid 178. A second group rated slightly less desirable: Beefsteak, Garden State, Marglobe, Pan American × Rutgers No. 16, Ponderosa, Potato Leaf B203, Santa Clara, and one strain of Yellow Plum. The other varieties (29 examined) received scores of good to fair.

Large fruited varieties disintegrated in boiling water, and their products were lower in viscosity and thinner in consistency than those of the small-fruited types. Other than these principal differences, however, products from both types compared favorably in color, texture, flavor, and general desirability. Tomatoes of all varieties showed low solids content and their pectin was destroyed in processing, so that larger percentages of fruit in the preserve mixture were necessary in order to obtain a desirable consistency. The authors suggest that the tomato could be advantageously used in making conserves as a base to which other fruits of more pleasing flavor could be added.

Use of wetting agents added to lye solutions for peeling peaches (*South Carolina Sta. Rpt. 1945, pp. 38-39, illus. 1*).—Three commercial wetting agents reduced the time necessary for the peaches to remain in the reaction chamber under actual operating conditions from 20 to 25 percent during an 8- to 10-hr. working period. The data presented emphasize that an increase in the speed of the peeling process increased the capacity of the peeling equipment, and second, a decrease in peeling time resulted in less cooking and softening of ripe peaches.

Oxidation and its control, E. H. WIEGAND. (Oreg. Expt. Sta.). (*Quick Frozen Foods*, 8 (1946), No. 9, pp. 81-83, 92, illus. 6).—Anti-browning agents used to prevent surface browning in peaches and apricots are reviewed. These include 0.10 percent thiourea, 5 percent sodium chloride, 30 percent or higher of sugar sirup, 1 percent sulfurous, 0.01 percent hydrochloric, or 2 percent citric and ascorbic acids, and heat to 180° F. or higher. In summarizing the work done to prevent oxidation in the freezing of these products, the author points out other essential considerations such as speed in handling, maturity and variety of the fruit selected, freezing temperatures, and packaging.

Polyphosphates as aid in home jellymaking, G. L. BAKER and G. M. GILLIGAN. (Del. Expt. Sta.). (*Jour. Home Econ.*, 38 (1946), No. 6, pp. 348-352, illus. 1).—This paper discusses the use of polyphosphates in the extraction of fruit juices for home jellymaking purposes. Experiments indicate that this use makes it possible to increase the pectic quality of certain fruit-juice extracts so that they have a relative viscosity of 12 or more (measured by the Ostwald pipette). A viscosity of 12 to 25 indicates that the ratio of sugar to fruit juice can be raised to 1.5 to 1, the ratio necessary for a quick-boil jelly. For viscosities greater than 25, it is recommended that the juices be diluted with water, enabling the sugar to dissolve more readily in a short-boil method.

Commercial jellymaking aided by polyphosphates, G. L. BAKER and G. M. GILLIGAN. (Del. Expt. Sta.). (*Food Packer*, 27 (1946), No. 6, p. 56).—The application of polyphosphates to the extraction of juices from apples and to a mixture of oranges and lemons for commercial jellymaking is discussed.

Advances in olive-processing methods in California and abroad, W. V. CRUESS. (Univ. Calif.). (*Fruit Prod. Jour. and Amer. Food Mfr.*, 25 (1946), No. 8, pp. 237-241, illus. 2).—An address presented at the 1946 Olive Growers' Conference, Lindsay, Calif.

Spoilage and other microorganisms of wine, W. V. CRUESS. (Univ. Calif.). (*Fruit Prod. Jour. and Amer. Food Mfr.*, 25 (1946), Nos. 8, pp. 229-231, 250; 9, pp. 260-262, 285).—The effects of bacteria or yeast attacking wines improperly prepared and stored are reviewed here. Film yeasts, which precede vinegar bacteria and cause a flattening of the flavor and bouquet, may be prevented if storage tanks and casks are completely filled and sealed at all times. Wine yeast (*Saccharomyces ellipsoidicus*), a frequent cause of clouding and fermentation of bottled sweet, unfortified white wines, is controlled by means of pasteurization and high concentrations of SO₂. Acetification of musts, spoilage by lactic acid bacteria, tourne spoilage, bitter ferment, slimy spoilage, tartrate-destroying bacteria, "hair bacillus" of wine, and malic acid-destroying bacteria are also discussed.

The new interpretation of sanitation, F. W. FABIAN. (Mich. State Col.). (*Canner*, 103 (1946), No. 2, pp. 12, 14, 16).—This is an address presented to the National Pickle Packers Association.

Nutritive value of the U. S. food supply, F. CLARK and J. B. MCCAY. (U. S. D. A.). (*Jour. Home Econ.*, 38 (1946), No. 6, pp. 333-337).—This rough estimate of the food intake of the population is based on surveys of family food consumption in different regions and net production figures representing total food supplies available for civilian consumption. The resulting figures represent the average quantities of food that enter the Nation's kitchen for each person each year if the food supply were equally divided among all the people. Estimates of the nutritive value of the national food supply indicate that there is enough food in the United States for everyone to have the nutrients needed for maintaining health. A comparison of the nutrients available in 1935 to 1939 with those in 1945 indicate these increases: Calories 2 percent, protein 14, calcium 22, iron 29, vitamin A 24, thiamine 47, riboflavin 39, niacin 40, and ascorbic acid 22 percent.

Food preparation equipment of small town families, D. DICKINS (*Miss. Farm Res. [Mississippi Sta.]*, 9 (1946), No. 4, p. 7).—The information reported pertains to the kind of equipment used by small-town families of Mississippi. How the kinds and amount of equipment vary with the residence and factors relating to food preparation equipment are discussed.

Influence of cooking processes on food nutrients: A compilation of abstracts, W. J. PETERSON and H. B. PRESSLY (*North Carolina Sta. Tech. Bul.* 81 (1946), pp. 133+).—This compilation, prepared as part of the National Cooperative Project, Conservation of Nutritive Values of Foods, brings together from *Chemical Abstracts*, *Experiment Station Record*, and *Nutrition Abstracts and Reviews* over the period from January 1934 up to July 1945, abstracts of all studies bearing on the effect of cooking, whether on large, small, or experimental scale, on the nutritive value of food. Progress reports of the National Cooperative Project and other material not covered by these journals was abstracted by one of the authors of the compilation. Use of the compilation, in which the abstracts are arranged alphabetically by commodities, is facilitated by complete indexes by commodities, by authors, and by nutrients as well as a further author index by commodities.

Nutrients consumed by army students at the University of Missouri, L. M. FLYNN and A. G. HOGAN. (Mo. Expt. Sta.). (*Jour. Amer. Dietet. Assoc.*, 22 (1946), No. 1, pp. 8-14).—Analyses were made to determine the average daily

intake of nutrients in food served during 1 week. Laboratory tests yielded the following average values for nutrients served per man per day: Calories 3,692, protein 155.7 gm., ether extract 108.6 gm., crude fiber 8 gm., sugars and starches 515.9 gm., total ash 35 gm., calcium 2.1 gm., phosphorus 2.7 gm., total vitamin A 22,517 I. U., vitamin A from carotene 17,804 I. U., thiamine 2.4 mg., riboflavin 3.7 mg., niacin 28.6 mg., reduced ascorbic acid 79.7 mg., and total ascorbic acid 117.9 mg.

Under conditions of the study, processing caused a loss of less than 10 percent of the carotene and vitamin A in the raw food; thiamine loss was approximately 10 percent and niacin loss 13.5 percent; loss of riboflavin was within the experimental error. The total loss of ascorbic acid (total) was 23 percent, with 40 percent of the original values obtained from raw foods such as citrus, which was not affected by processing; loss of total ascorbic acid from other fruits and vegetables in kitchen processing was approximately 40 percent.

Dietary study of Cornell University women, C. M. YOUNG. (Cornell Univ.). (*Jour. Amer. Dietet. Assoc.*, 22 (1946), No. 1, pp. 25-28).—This paper reports the results of an investigation conducted in 1942-43 to gather facts relative to the dietary habits of university students. Observations were made of groups of ten women students living under five different circumstances: In a supervised dormitory, in a sorority house, on different campus-controlled cottages with meals served in a central dormitory, in private homes where students work for room and board, and in a graduate house in which residents were free to choose their own eating places. An examination of individual weekly averages showed that for all nutrients the intakes of all women were within the figures used for minimum requirements, which were taken as two-thirds of the National Research Council's recommendations. The one sorority group represented had the lowest intake of all nutrients calculated, and the graduate student group had the next poorest showing. The average figures for the two university supervised groups and the board groups showed satisfactory intakes of all nutrients. An investigation of the intake of specific foods in the food records showed no one who did not drink at least some milk every day—93 percent drank at least one glass. About two-thirds of the women ate one or more servings of meat daily; one-fifth did not eat even one egg during the entire week—the remaining four-fifths ate at least one to three per week; only one-third had as much as one serving of whole grain cereals per day; 95 percent had at least one serving of fruit per day, and about one-half had had two or more; three-fourths had two or more servings of vegetables per day—more than one-third had three or more.

Meat in the diet of pregnant women, R. M. LEVERTON and T. J. McMILLAN. (Nebr. Expt. Sta.). (*Jour. Amer. Med. Assoc.*, 130 (1946), No. 3, pp. 134-136, illus. 1).—The study reported here tests the effectiveness of the recommendation to "eat plenty of meat—a generous serving at least twice a day." The 33 women who participated in the study throughout the entire period from 4 mo. before delivery until 3 mo. after delivery were grouped in 11 sets of matched partners. In each set, one woman received as a daily supplement to the freely chosen diet a 5-oz. serving of meat; another woman received a vitamin B complex supplement furnishing 2 mg. of thiamine, 1 mg. of riboflavin, 20 mg. of niacin, and other factors of the complex; and the third partner, serving as a negative control, received no supplement. The average daily protein intake on the freely chosen diets was 58 gm.; this was raised to 83 gm. in the group receiving the meat supplement. Hemoglobin values and red blood cell counts at 1 mo. after delivery both showed increases of 20 percent over initial values in the group receiving the meat supplement as compared with 7- and 10-percent increases, respectively, for women receiving the B complex supplement and 4- and 12-percent increases, respectively,

in the control group. These results and clinical observations throughout the study suggest that a generous meat intake during pregnancy is effective in increasing hemoglobin and red cell concentration, avoiding edema, and promoting lactation.

The nutritive status of women in the fifth and sixth decades.—I, Metabolism of calcium, nitrogen and phosphorus (*Iowa Sta. Rpt. 1945, pt. 1, pp. 264-265*).—This preliminary report of a study by P. P. Swanson et al. indicates that data to date have been obtained on 10 subjects in this age group. These older women drank only 1 cup of milk daily when living on their customary self-chosen diets. With additional milk, the intake of Ca, P, and N increased and the retention of each nutrient became greater. These subjects needed a daily intake of 0.8-1.0 gm. Ca and 1.3 gm. P, and a daily N intake of 1 gm. per kilogram body weight. One pt. of milk daily was needed to provide enough of these constituents to establish equilibrium.

Relation of diet of Florida school children to tooth and bone structure (*Florida Sta. Rpt. 1945, p. 71*).—This is a brief summary report by O. D. Abbott and R. B. French of the findings of roentgenological and dental examinations of Florida school children in certain schools observed in the period 1941-45. Study of the 453 roentgenograms taken at the beginning of the study in children in six schools in Marion County and the Day School in Lafayette County indicated that approximately 70 percent of the children 6-10 yr. of age had various defects and some degree of retarded development of the wrist bones. In about 10 percent of the cases, one to three bones were missing entirely. In 1941 the incidence of caries in two schools were 85 and 79 percent, respectively, while the incidence of gingivitis in the same schools was 73 and 76 percent, respectively. The children showing severe caries and delayed maturation of the wrist bones were given special diet supplements, and with improved diet, yearly roentgenograms on selected cases showed progressive improvement of the wrist bones. In some cases, ossific centers which the year before appeared as mere shadows or points had increased to a semblance of a bone and in many cases calcification apparently was accelerated. Also, the incidence of caries decreased and by 1944 was rare in both schools, where gingivitis likewise had been greatly decreased. Even in 1945, when transportation difficulties and high costs of citrus fruits had prevented the use of these fruits in optimum amounts in one school, there were still no severe cases of gingivitis.

Improving the diet by the use of wheat substitutes and green vegetables, O. SHEETS (*Miss. Farm Res. [Mississippi Sta.], 9 (1946), No. 3, pp. 1-2*).—Data are given on the nutritive composition of different kinds of flour, and comparisons are made with that of substitute foods. Degerminated cornmeal has as high a nutritive value as unenriched white flour, with the exception of the protein content. Potatoes, because of their high moisture content, have a lower nutritive content in most respects than white flour, but served in large quantities would be comparable and, at the same time, furnish considerable vitamin C. Mature beans and peas have approximately the same caloric value as flour, and are richer in several nutrients.

Human starvation and its consequences, A. KEYS. (Univ. Minn.). (*Jour. Amer. Dietet. Assoc., 22 (1946), No. 7, pp. 582-587, illus. 2*).—"Effects of an extensive experiment in semistarvation on 32 human volunteers who lived on a European type of famine diet for 6 mo. and were subsequently studied during rehabilitation on various fixed 'relief' diets are reported. Preceding the period of undernutrition there were 3 mo. of control and standardization studies. The men lived in the laboratory and maintained a fixed regimen corresponding to light industrial work. A daily intake of slightly more than 3,150 calories was needed for balance in the control period; the famine diet averaged 1,760 calories

including 49 gm. of proteins and fairly reasonable amounts of vitamins and minerals.

"In semistarvation there developed progressive and severe weakness, depression, fatigue, anemia, bradycardia and edema. There were small effects on co-ordination, speed, and plasma proteins. There were no adverse effects on vision, hearing, or general intellectual capacity. The mean weight loss was 37 lb., amounting to 24 percent of the original body weight. The true weight loss, corrected for edema and hydremia, was about 50 lb., of which fat accounted for about 30 percent. There were few if any unequivocal signs of vitamin deficiencies.

"In rehabilitation it was found that only diets averaging over 2,500 calories daily allowed significant recovery, and with the best diet, averaging about 3,500 calories, recovery was only about 50 percent in 3 mo. Full recovery required 8 to 12 mo. Extra vitamins and proteins had little apparent effect on the rate or course of recovery."

Carbohydrate metabolism, S. SOSKIN and R. LEVINE (*Chicago: Univ. Chicago Press, 1946, pp. 315+*, illus. 75).—This volume, intended to serve as a reference text for the teaching of carbohydrate metabolism to students of physiology, biochemistry, and medicine, is presented in five parts dealing with (1) the biochemistry and energetics of carbohydrate metabolism, (2) introductory physiological considerations, (3) critical survey of the classical criteria of diabetes, (4) the role of the endocrine glands in carbohydrate metabolism, and (5) integration of physiological and clinical aspects. The volume also deals in considerable detail with certain aspects of protein and fat metabolism. The selected bibliographical references associated with each chapter total more than 1,200 in number.

The effect of processing on the biological value of eggs (*Iowa Sta. Rpt. 1945, pt. 1, pp. 260-263*).—This progress report by P. P. Swanson, G. F. Stewart, et al., on the nutritive value of the proteins of dehydrated eggs indicates that the biological efficiencies as tested with rats by Mitchell's balance method were 109, 111, and 108 percent for dehydrated whole eggs, egg yolks, and egg whites, respectively; that these proteins were even more efficient than those of the animal's own tissues (liver, muscle); and as efficient as a mixture of 10 amino acids essential to the nutrition of the rat. Methionine tested separately was found to be as efficient as were the whole egg proteins or the mixture of 10 amino acids. When the calories furnished by the diet were only 50 percent of the normal, a break in the utilization of the egg proteins occurred.

Modifications in blood, urine, and tissues of rats affected with pregnancy disorder induced by feeding diets containing pork (*Iowa Sta. Rpt. 1945, pt. 1, pp. 258-259*).—Studies by P. P. Swanson et al., directed toward determining the nature of dietary deficiencies involved in the toxemias of pregnancy, particularly as observed in rats fed on a diet containing autoclaved pork muscle (E. S. R., 94, p. 544), showed that certain abnormalities of carbohydrate and protein metabolism occurred in the pregnant, pork-fed rats. Specifically, the glucose tolerance curves of these rats were diabetic in character, especially in the pregnant, pork-fed rats showing toxic symptoms. Nonprotein nitrogen and urea increased in the blood and plasma proteins decreased as toxemia developed. It was observed that these characteristic metabolic abnormalities in the toxic rat did not appear until the animal was acutely ill.

Influence of manganese intake upon urea excretion, J. T. SKINNER and J. S. McHARGUE. (Ky. Expt. Sta.). (*Ky. Acad. Sci. Trans.*, 11 (1943-44), Nos. 3-4, pp. 47-50).—"Urea excretion was determined on rats at varying levels of food consumption and on low, medium, and high intakes of manganese. In the manganese groups, the urea excretion ranged from 82 to 139 and averaged

101 percent of that excreted by the respective pair-mate controls. In 7 out of 18 comparisons, it was observed that the manganese-fed rat excreted more urea than its pair mate on a low-manganese ration."

Vitamin studies on lima beans, J. F. EHEART, R. C. MOORE, M. SPEIRS, F. F. COWART, H. L. COCHRAN, O. A. SHEETS, L. McWHIRTER, M. GIEGER, J. L. BOWERS, P. H. HEINZE, F. R. HAYDEN, J. H. MITCHELL, and R. L. CAROLUS (*Virginia, Georgia, Mississippi, South Carolina, and Virginia Truck Stas. and U. S. D. A. Region. Vegetable Breed. Lab., South. Coop. Ser. Bul. 5 (1946), pp. 24, illus. 3.*).—This study was conducted as one part of the Southern cooperative nutrition project on variations in the composition and nutritive value of vegetables grown in the South. The experiment, designed to admit of statistical analysis of the data, was cooperatively planned and executed, with the object of determining the effects on nutritive value of such factors as variety, location, bean maturity, plant maturity, storage, and cooking. This report presents the details of the experimental plan, the chemical methodology, the statistical methods, and the experimental results.

The Carolina Sieva pole beans and the Henderson bush beans, each grown at the six locations from a common seed source and under similar conditions of cultivation, showed no varietal differences in thiamine and riboflavin content. The two varieties differed only in respect to ascorbic acid content, the pole variety being about 17 percent higher in this vitamin than the bush variety. The authors indicate, however, that the pole variety cannot be recommended too highly as being superior to the bush variety on the basis of this difference, particularly since it was smaller after cooking and since the differences in thiamine and riboflavin were not significant. Highly significant location differences were obtained for all three vitamins; likewise, between years (1943, 1944, 1945) at the same location highly significant differences were obtained for ascorbic acid. Thiamine contents (in 1945) varied from 713.2 $\mu\text{g.}$ per 100 gm., dry basis, at Experiment, Ga., to 1,108.2 $\mu\text{g.}$ at Charleston, S. C.; and riboflavin varied from 208.3 $\mu\text{g.}$ at State College, Miss., to 359.0 $\mu\text{g.}$ at Experiment. Ascorbic acid varied from 55.5 mg. per 100 gm., dry basis, at Charleston in 1943 to 112.9 mg. at Experiment in 1944. Ascorbic acid, thiamine, and riboflavin contents decreased with bean maturity, but the decrease was greater for ascorbic acid and riboflavin than for thiamine.

In these experiments, the beans, shelled from the freshly harvested pods, were separated into three bean maturity lots, representing (1) immature green beans, one-half to two-thirds mature size and green in color; (2) mature green beans, mature in size and green or greenish-white in color; and (3) mature white beans, mature in size and white in color. Analyses of beans harvested at different stages of maturity of the plant itself gave no evidence that age (maturity) of the plant affected the ascorbic acid, thiamine, or riboflavin contents of the beans as long as maturity of the beans remained constant.

Analyses of beans stored under various conditions showed that beans were more nutritious in the fresh, unstored state than when they were stored. The best method of storage was in the pod, under refrigeration, only 5 percent of the ascorbic acid thus being lost in 48 hr., while shelled beans similarly stored lost 16 percent. Losses of ascorbic acid were much greater during room storage than during refrigerator storage, 39 percent being lost in the 48-hr. room-stored samples while 67 percent was lost in the shelled beans similarly stored. Greater losses of ascorbic acid occurred in the first than in the second 24 hr. when shelled beans were stored at room temperature. The combination of room storage and bean maturity affected the ascorbic acid content of the beans much more than it did the thiamine and riboflavin contents. In general, thiamine and riboflavin contents of the beans were not influenced by room storage for as long as 48 hr.

Cooking of the beans in experimental lots of 50 gm. dropped into 100 cc. of boiling distilled water brought about large cooking losses. When the beans were thus cooked for $\frac{1}{2}$ and 3 hr., respectively, about 82 and 59 percent of the ascorbic acid originally present in the raw beans remained in the cooked beans; however, when the beans were room-stored and then cooked for these two periods, respectively, the cooked beans retained only 23 and 12 percent of the ascorbic acid initially present in the fresh, raw beans.

"In order to obtain the highest nutritive value with respect to vitamin content from lima beans, the following recommendations, in light of the present study, may be listed: (1) Harvest the beans at the earliest marketable stage of maturity possible; (2) cook the beans as soon after harvesting and for as short a time as possible; (3) if the beans are not cooked immediately after harvesting, leave them in the pod and store them in the refrigerator; and (4) do not shell the beans until immediately before cooking."

Vitamin content of frozen peas, green beans and lima beans, and market-fresh yams prepared in a Navy mess hall, A. M. BRIANT, V. E. MACKENZIE, and F. FENTON. ([N. Y.] Cornell Expt. Sta.). (*Jour. Amer. Dietet. Assoc.*, 22 (1946), No. 7, pp. 605-610).—Thiamine, riboflavin, and ascorbic acid were determined in vegetables before and after several methods of large-scale cooking and holding procedures carried out in a Navy mess hall.

The results of this study are given as "apparent retentions", calculated on the basis that the content in milligrams per 100 gm. raw frozen vegetable was 100 percent, thus assuming that there was no change in weight and moisture contents during the different preparation procedures. The thiamine content of 100 gm. uncooked frozen peas was 0.29 to 0.35 mg.; cooked peas, 0.20 to 0.33 mg.; and peas after cooking, 0.16 to 0.24 mg. The corresponding riboflavin content was 0.078 to 0.10 mg.; 0.071 to 0.082 mg.; and 0.067 to 0.081 mg., respectively. Ascorbic acid content was 7.7 to 15 mg.; 5.2 to 9.5 mg.; and 4.1 to 7.8 mg., respectively.

The concentration of these vitamins in the green beans, lima beans, and yams after cooking and holding covered a similarly wide range, due to the wide variation in the details of the cooking procedure. In general, the vitamin concentration decreased with the increase in the length of the holding period.

Vitamin retention in frozen peas and frozen green beans in quantity food service, A. M. BRIANT, V. E. MACKENZIE, and F. FENTON. ([N. Y.] Cornell Expt. Sta.). (*Jour. Amer. Dietet. Assoc.*, 22 (1946), No. 6, pp. 507-510).—In this paper, an outgrowth of the preceding study, frozen green peas and frozen green beans were defrosted for 3 hr. at room temperature before cooking by three quantity methods. The vegetables which were boiled in tap water showed the lowest thiamine and riboflavin retention, while the steamed peas and beans showed the highest retention. Steamed peas, however, showed the lowest retention of ascorbic acid, and a further loss occurred during holding. All the thiamine and riboflavin lost from the vegetables during cooking was found in the cooking water, while holding them brought about no change.

The drained cooked peas retained from 66 to 94 percent of the original thiamine content present in the uncooked frozen peas. Other percentage retentions were riboflavin 67 to 98 percent and ascorbic acid from 34 to 69. The corresponding figures for the green beans were thiamine from 55 to 95 percent, riboflavin from 56 to 93 percent, and ascorbic acid from 37 to 55 percent.

Effects of canning and drying on the carotene and ascorbic acid content of chile, E. M. LANTZ (*New Mexico Sta. Bul.* 327 (1946), pp. 21, illus. 4).—Following earlier work on the carotene and ascorbic acid contents of hot and paprika-type peppers (E. S. R., 94, p. 408), the study here reported was undertaken to determine the amounts of these vitamins in home or commercially

canned or dried green and dried ripe (red) peppers (*Capsicum annuum*) of the hot variety. The Spanish word "chile" is used in this bulletin to refer to these hot varieties.

Peeled, seeded, and precooked green chile (as obtained by holding the pricked pods in hot oil at 350°–400° F. until the skin blistered and could be peeled off) was canned in a pressure cooker with processing times of 20–25 min. at 240°. Analyses of samples before and after processing indicated that during canning the green chile retained practically all of the carotene of the prepared, uncanned chile and about two-thirds of the ascorbic acid value. Sampling difficulties were considered to be responsible for certain anomalous calculated carotene retentions of more than 100 percent. Carotene values for the freshly canned products averaged about 83 mg. per 100 gm., and ascorbic acid values about 300 mg. per 100 gm. There was a slight gradual loss of both vitamins during storage of the canned product.

The artificial drying of either green or red chile was found to offer a number of advantages over the time-honored practice of sun-drying. These include greater attractiveness and palatability of the product, freedom from mold, and the saving of time. With the green chile, artificial drying also improved the vitamin retention. Home-constructed cabinet dehydrators gave a rather more satisfactory product with better vitamin retaining properties than did the simple tank-type, steam-heated dehydrator. A preliminary 10-min. steaming of the peeled, green chile improved the carotene retention but had a slightly unfavorable effect on ascorbic acid retention. Although the use of artificial heat to dry the whole, red chile pods cut the drying time from several weeks to 3 days, it did not materially affect the retention of carotene or ascorbic acid. No method of drying the red peppers yielded a product that could be considered even a fair source of ascorbic acid, although most of the carotene was retained, making them a very concentrated source of that vitamin. Analyses of certain commercially prepared chile products available on the local market showed them to be exceedingly variable in carotene and ascorbic acid content.

Effect of quantity preparation procedures on vitamin retention: Canned tomatoes. E. GLEIM, M. ALBURY, K. VISNYEI, J. R. MCCARTNEY, and F. FENTON. (Cornell Univ.). (*Jour. Amer. Dietet. Assoc.*, 22 (1946), No. 1, pp. 29–31).—

The ascorbic acid, niacin, and carotene content of commercially canned tomatoes was determined and their retention during five heating procedures commonly employed in large-scale food preparation ascertained. These procedures were as follows: (1) Heated in open pan in steamer set at 5 lb. pressure for 15 min., (2) heated unopened in steamer set at 5 lb. pressure for 25 min., (3) heated to 80° C. in stockpot on gas plate (40 to 60 min.), (4) brought to simmer in stockpot (37 to 48 min.) and held 30 min. at a simmer, and (5) brought to simmer in stockpot (29 to 33 min.) and held 3 hr. at a simmer. The ascorbic acid in the total unheated contents of the cans varied from 13.9 to 16.6 mg. per 100 gm., carotene 0.366 to 0.397 mg., and niacin 0.515 to 0.577 mg. per 100 gm. A decrease from 16.6 to 13.9 mg. per 100 gm. occurred during the 2-mo. period of the study, while the thiamine and riboflavin contents, 0.564 and 0.361 mg. per 100 gm., respectively, were so low that cooking losses were not determined. In each of the methods of heating, ascorbic acid tended to become equally distributed between the pulp and liquid and there was a 92 to 94 percent retention after heating by the first method. Prolonged heating was harmful, with method No. 5 showing a 70 to 81 percent loss. Almost three times as much carotene was present in the pulp as in the juice, while none of the described methods of heating caused significant difference in the retention. More niacin was present in the pulp than in the liquid, but during heating this vitamin tended to become equally distributed. An

appreciable loss of niacin occurred during heating by method No. 5 (70 to 81 percent).

Vitamin content of peas: Effect of freezing, canning, and dehydration, C. H. MAHONEY, E. P. WALLS, H. A. HUNTER, and L. E. SCOTT. (*Md. Expt. Sta.*). (*Indus. and Engin. Chem.*, 38 (1946), No. 6, pp. 654-657).—Comparable lots of eight varieties of peas were canned, frozen, and dehydrated, and ascorbic acid was determined on the product after a 6-mo. storage period, before and after cooking. Ascorbic acid retention (dry basis) after a 6-mo. frozen storage varied from 46.1 percent for the Pride variety to 71.4 percent for Teton, with an average for the eight varieties of 58.4 percent. The retention in the canned drained peas after the same storage period varied from 41.0 for Pride to 53.4 percent for Teton, with an average of 47.4 percent. The total retention of the canned peas (drained peas plus the liquor) varied from 72.3 percent for Pride to 91.7 percent for Early Harvest, with an average of 79.0. Dehydrated peas contained about one-third as much ascorbic acid as frozen or canned peas; when stored under CO₂ they had a higher level than those stored under air or in vacuum. After cooking, ascorbic acid retention (dry basis) of the products, compared with the original content, was 58 percent for the canned material, 53 percent for the frozen, and 19 percent for the dehydrated.

Frozen peas showed higher carotene values than those of the canned or dehydrated lots, and thiamine retention for the frozen and canned peas was about two-thirds while dehydrated peas retained one-half of the original content.

The effect of curing on the carotene and ascorbic acid content of sweet potatoes (*South Carolina Sta. Rpt. 1945, p. 70*).—Seven varieties of sweetpotatoes, two with white flesh, were analyzed for carotene and ascorbic acid immediately after harvest, and for ascorbic acid after a 10-day curing period. Carotene in the five yellow-fleshed varieties varied from 2.80 to 5.19 mg. per 100 gm. of fresh sample. At harvest, ascorbic acid ranged from 23.16 to 32.62 mg. per 100 gm. fresh basis. At the end of the curing period the values ranged from 15.26 to 23.38 mg. per 100 gm. and represented losses from as low as 6.30 percent in one of the yellow-fleshed selections to as high as 36 and 53 percent in the two white-fleshed varieties, respectively.

Effect of processing on the carotenoids and vitamin C content of peaches (*South Carolina Sta. Rpt. 1945, pp. 70-72*).—In continuation of this study (E. S. R., 93, p. 657), 13 canning varieties of peaches were sampled at the cannery before and after lye peeling, and immediately made into blended mixtures for analysis by use of the Waring blender. Two percent HPO₃ was used as the extractant for the ascorbic acid blend and a mixture of 50 cc. alcohol and 70 cc. hexane for the carotenoids blend. The peaches, averaging 1.52 mg. of total carotenoids and 6.50 mg. ascorbic acid per 100 gm. of fresh sample, showed an average loss of 13.2 and 24.2 percent of these two vitamins, respectively, in the lye peeling process. The lye-peeled peaches packed in 11-oz. portions in a sugar solution in paper cartons and frozen, showed a loss of both vitamins over a 7-mo. storage period, the loss of ascorbic acid in the different varieties varying from 30.2 to 65.8 percent and that of carotenoids from 0.0 to 26 percent. These vitamin losses in the freezing process were much larger than those observed in canning in the case of ascorbic acid, although the reverse was true for the carotenoids.

A two-year study of the vitamin A potency of Louisiana milk and butter, H. LEWIS and E. A. FIEGER (*Louisiana Sta. Bul. 405 (1946), pp. 10, illus. 1*).—In this study, conducted as part of the national cooperative butter project, vitamin A and carotene were determined by the chemical methods suggested by the technical committee of the project. These determinations were made on 33 samples of representative creamery and herd milks produced in the State and on 2 of butter

supplied monthly over a 2-yr. period. Data presented in a preliminary report (E. S. R., 93, p. 187) have been recalculated for the present final report, using the factor 4 (rather than $3\frac{1}{2}$) for converting micrograms of vitamin A into International Units of the vitamin.

The monthly averages for the vitamin A in these Louisiana herd and creamery milks and creamery butter are reported for the interval October 1943 through September 1945. The herd milks varied from 1,097 to 3,211 I. U. and averaged 1,977 I. U. per quart over this period; the creamery milks varied from 815 to 2,803 I. U. and averaged 1,616 I. U. per quart; and the creamery butters varied from 6,886 to 22,505 I. U. and averaged 14,445 I. U. per pound. The lower values for the creamery milks are attributed to the standardized adjustment to about 3.8 percent butterfat. Information reported by cooperators furnishing the milk samples told of the type of pasture and its condition, the nature of roughage and concentrate which were fed, and the number of cows which freshened. This supplementary information, considered in conjunction with the analytical data, indicated that the vitamin A values for the dairy products were high when ample green pasture was available and low during the winter and extremely dry summer months. The most striking effect of pasture conditions was shown by grazing cows for 1 or 2 hr. a day on fall-planted oats. The increase in vitamin A potency brought about by the use of supplemental oat pasture varied from time to time but averaged about 33 percent. The grazing of clover pastures was also reflected in increased vitamin A potency of milk from practically all herds, and the combination of clover with supplemental oat pastures resulted in milk more potent in vitamin A than did either forage alone.

The vitamin A and carotene content of market butter produced in Kansas, D. B. PARRISH, W. H. MARTIN, F. W. ATKESON, and J. S. HUGHES. (Kans. Expt. Sta.). (*Jour. Dairy Sci.*, 29 (1946), No. 2, pp. 91-99, illus. 2).—This study, carried out as a part of the national butter project, presents the results of tests made on the vitamin A and carotene potency of butter produced in Kansas during the period July, 1943, through December, 1944. In addition to this phase of the study, certain other data were obtained on butter composition and quality, pasture conditions, and feeding practices in relation to the vitamin A and carotene content.

The 1944 mean annual vitamin A potency was 15,100 International Units per pound, while the period, December to April, was 11,050 I. U., and from May to November, 17,700 I. U. In these respective periods, carotene accounted for 19.6, 14.9, and 21.4 percent of the total vitamin A potency.

"The vitamin A and carotene content of butter produced in different areas of the State and during different months of the year varied with the pasture available. When little or no pasture existed, the values for vitamin A and carotene dropped. Good pasture conditions increased the vitamin A and carotene values to maximum in May and June. During the hot summer weather the values dropped off somewhat, returning to higher levels when pastures improved in the fall of the year."

No correlation between the Nafis color grade and the vitamin content of the butter was found due to the use of artificial colors in the winter months.

Effect of storage on carotene of plant extracts, A. R. KEMMERER and G. S. FRAPS. (Tex. Expt. Sta.). (*Indus. and Engin. Chem.*, 38 (1946), No. 4, pp. 457-458).—"During storage, up to 8 mo., of 13 samples of dried grasses and dried foods, the percentage of impurity A increased in the crude carotene fraction. The percentage of β -carotene in the pure carotene fraction decreased in 6 samples and remained nearly constant or increased slightly in the other 7. The percentage of neo- β -carotene U in the pure carotene increased in 11 of the samples, and that of neo- β -carotene B decreased in 10. The quantity of

impurity A increased in dehydrated carrots up to 14 mo. of storage and in beet greens up to 4 mo. of storage. In all other samples there was a decrease in the amount of impurity A. β -Carotene, neo- β -carotene U, and neo- β -carotene B decreased in all the samples except beet greens, in which there was a slight increase in neo- β -carotene B during the second and fourth months of storage."

Effect of milling, processing, washing, cooking, and storage on thiamine, riboflavin, and niacin in rice. M. C. KIK (*Arkansas Sta. Bul. 458 (1945), pp. 60, illus. 6*).—Following an earlier summary of the results of rice protein studies (E. S. R., 87, p. 303), the present bulletin brings together in considerable detail the findings of the station on the thiamine, riboflavin, and niacin content of rice. Some of these studies have been reported earlier (E. S. R., 90, p. 135; 92, p. 592). Background information supplied concerns the structure of the rice kernel in relation to the results attained by the milling processes described for the production of brown and polished rice and byproducts, of parboiled milled rice, of unmilled or unpolished rice, and of commercially processed rices including converted, Malekized, Earle processed, and artificially enriched rices. Analytical methods used in the study are presented in detail. In addition, several simplified tests that have been proposed for the determination of thiamine were applied to rice. Of these, a cold or warm extraction with 25 percent KCl in 2 percent acetic acid and subsequent oxidation was found to be a promising short-cut method.

Analytical results obtained showed that, on an average, in the milling of brown rice to white, polished rice 76 percent of the thiamine, 56 percent of the riboflavin, and 63 percent of the niacin were lost. At a 70-percent level in the diet of rats, brown rice was found to be superior to white rice as a source of riboflavin and thiamine and slightly better as a source of pyridoxine and inositol. Rice varieties grown in Arkansas, Louisiana, Texas, and California, the main rice-producing States, showed varietal differences in thiamine and riboflavin, but only slight differences in niacin. Location apparently had a slight influence on thiamine and riboflavin but an insignificant influence on niacin. The data on variously milled and treated samples suggested that losses due to milling could be lessened by (1) a less severe milling, as in undermilling or unpolishing and in the Earle peeling process, or (2) pretreatment of the rice by soaking and steaming as in the Malekiz process or by soaking and parboiling by the modernized method known as rice conversion. As a third alternative, enrichment may be practiced.

Washing of rice preliminary to cooking was found to effect losses of 21, 7, and 13 percent, respectively, of the thiamine, riboflavin, and niacin in brown rice. Washing losses were high in white polished and sprayed enriched rice but smaller again in Malekized, converted, and Earle rice. "As an effect of cooking in all types of rice, small losses were found in the double boiler type of cooking and large losses were found in the open vessel type of cooking. However, even with the latter type of cooking, better retention took place in converted, Earle rice, and brown rice than in white milled rice. These losses were small in rice artificially enriched according to the methods of Fieger and Hoffmann-La Roche."

Cold storage up to 2½ yr. effected no significant losses in thiamine or niacin and only slight losses in riboflavin, whereas storage at room temperature caused appreciable losses which were greater in ground than in whole kernels.

The nutritional improvement of white rice. M. C. KIK and R. R. WILLIAMS. (*Ark. Expt. Sta.*). (*Bul. Natl. Res. Council, No. 112 (1945), pp. 76+, illus. 16*).—This bulletin was prepared with the purpose of collecting, "as far as possible, the essential facts that indicate the relative promise of each of the various expedients to improve the quality of milled rice and furnish criteria

for future commercial practice." Consideration is given to rice production and consumption in the Orient, United States, Puerto Rico, and Europe; rice cookery as practiced in these regions and losses of nutrients in rinsing and cooking rice; the nutritive qualities of rice; polished rice and beriberi; proposed corrective measures against beriberi; commercial rice milling by standard and modified procedures; the deterioration of rice in storage from the standpoint of insect attack, rancidity, and losses of nutrients; the parboiling of rice and the increased retention of nutrients effected by application of this treatment prior to milling; the modernized parboiling processes referred to as rice conversion; and the artificial enrichment of rice. The experimental data presented are largely from the Arkansas Station and are based on the studies covered by the above report.

Effect of methods of cooking fresh and cured pork and of canning fresh pork, on the riboflavin content (*Kentucky Sta. Rpt. 1945, pp. 9-11*).—In continuation of studies on the vitamin content of pork (E. S. R., 93, p. 661), conducted as part of the National Cooperative Project, Conservation of Nutritive Values of Foods, loin, spareribs, liver, ham, and shoulder cuts from 6-month-old pigs raised under uniform conditions were analyzed for riboflavin; certain aliquots were analyzed in the raw state, others after cooking or canning. For later analyses of cured meat, the left hams and shoulders of half of the pigs were salted, smoked, and stored in a cool dry place. The cooking methods used were those approved by the committee on preparation factors of the national cooperative meat investigations: Riboflavin was determined by the Conner and Straub method.

In general, the cooking loss of riboflavin was found to be less than that of thiamine or niacin; in longer cooking such as in canning there were even apparent increases in riboflavin. This apparent increase in riboflavin was also observed in curing, with further increases upon cooking of the cured meat. Pork liver, raw or cooked, was notably rich in riboflavin as compared with the other two vitamins. The best source of riboflavin in the cooked muscle cuts was boiled shoulder. Poorest was roast loin. These were estimated to furnish, respectively, 227 and 98 $\mu\text{g.}$ of riboflavin in a serving portion equivalent to $\frac{1}{4}$ lb. of the raw meat.

Effect of roasting and reheating on the thiamine content of turkey (*Kentucky Sta. Rpt. 1945, pp. 11-12*).—This study, conducted as part of the National Cooperative Project on the Conservation of Nutritive Values of Foods, utilized eight Broad-Breasted Bronze tom turkeys 6½ mo. old that had been raised on good range with corn and oats fed separately. The birds, with dressed weights of 17-22 lb., were held wrapped in parchment in freezing storage for 7 weeks before sampling and analysis of the paired halves on the raw and cooked basis, respectively. The halves for roasting were placed cavity-side down on the roaster rack, which was covered with parchment paper on which had been placed the halves of gizzard and liver. Each half was roasted to an inner temperature of 190° F. at a constant temperature of 275°.

The raw dark meat in the several birds averaged 66.9 to 87.3 $\mu\text{g.}$ percent of thiamine and the raw white meat 39.1 to 45.1 $\mu\text{g.}$ percent on the moist basis. The raw portions of dark meat next to the skin contained more thiamine than portions extending toward the bones. The same was true of the thiamine content of white meat, but to a lesser degree. The loss of thiamine due to roasting was greatest in the portion just underneath the skin, with an average of 39.3 percent loss in white meat and 54.1 percent in dark meat. After removal of the slices for analysis on the freshly cooked basis, the turkey halves were held in the refrigerator for 24 hr., after which the white meat was removed from the carcass in slices and the dark meat was removed in as large pieces as possible. One portion each

of dark and white meat was analyzed cold, the second portion was heated on a steam table (as in cafeteria service) for 20 min., and the third portion for 50 min. before analysis. "The roasted dark meat extending further in and sampled 24 hr. after roasting without reheating contained more than the sample taken immediately after roasting. When the dark meat of this portion was reheated, about the same loss of thiamine occurred as in the portion just underneath the skin. The slices of roasted white meat that had stood 24 hr. and been analyzed either as cold sliced meat or reheated showed about an equal loss of thiamine, that is from 22.5 to 24.7 percent." The moist, raw gizzard averaged 43.5 μ g. percent of thiamine, while the figure for the roast gizzard was 37 percent less than that for the raw. The entire amount of drippings contained from 336 to 2,790 μ g. of thiamine. Skin had but little thiamine, averaging on the raw moist basis but 24.8 μ g. percent. Raw liver averaged 205 μ g. percent of thiamine on the moist basis and showed a loss of 8.9 percent of thiamine due to roasting.

Ascorbic acid content of food served in a cooperative residence hall for women. M. L. DUNKERLEY and M. M. KRAMER. (Kans. Expt. Sta.). (*Jour. Amer. Dietet. Assoc.*, 22 (1946), No. 1, pp. 15-19).—Samples were taken for six representative periods, totaling 44 days, during the fall, winter, and spring seasons. Calculations were made to show total ascorbic acid provided per person per day, based on milligrams per 100 grams and per serving of food. All foods containing fruits, vegetables, or milk were studied.

"The ascorbic acid averaged 70.9 mg. per person per day, and ranged from 24.5 to 146.3 mg. In two periods the ascorbic acid supplied was about 15 percent more than the recommended 70 mg. daily. However, during three periods the averages were about 10 percent below this." The daily menus were analyzed as to source and distribution of ascorbic acid—citrus fruit was found to supply one-third and leafy vegetables one-fifth of the total ascorbic acid. There was a wide variation in the cost of different foods supplying ascorbic acid.

The effects of icing on retention of quality and ascorbic acid in vegetables. M. SPEIRS, E. L. WARREN, F. H. WILSON, and V. G. GREENLEAF. (Ga. Expt. Sta.). (*Ice and Refrig.*, 111 (1946), No. 1, pp. 19-22, illus. 1).—Samples of asparagus of the Mary Washington variety were obtained from six harvests between April 16 and May 4 in 1945 and from five harvests between April 3 and April 10 in 1946. The results of changes in quality, weight, and ascorbic acid and moisture content for asparagus stored under various conditions are noted.

The quality of asparagus held with heavy icing in a well-insulated chest was excellent for 21 days, while bunches held with moderate icing remained in excellent condition for 6 days. Bunches iced moderately in the daytime and refrigerated at night were in excellent condition for 4 days and good for 6 days. Storage at room temperature in the daytime and cold storage at night, or held at room temperature in water, produced some deterioration in quality. Asparagus samples stored at room temperature in water were fair in quality after 3 days and inedible after 6 days in 1945 and after 5 days in 1946.

Marked changes in weight accompanied losses in quality, except in those cases in which the butts were placed in water. Decreases in ascorbic acid content were rapid during storage under all conditions except heavy icing, in which 81 percent was retained after 5 days storage.

Effect of storage conditions on ascorbic acid content of kale and cantaloupe. G. M. GILLIGAN and C. W. WOODMANSEE (*Delaware Sta. Pam.* 23 (1946), pp. 3+).—Scotch Blue Curled kale, freshly harvested from the field in samples sufficiently large to insure uniformity, was placed under the following storage conditions with the least possible delay: (1) Embedded in and completely covered with chopped ice, (2) placed in a cabinet containing block ice, and (3) left in the

open storage shed. The mean temperatures for these three storage conditions, respectively, were 34°, 40°, and 77° F. These freshly harvested kale leaves (less midrib) averaged 124 mg. of ascorbic acid per 100 gm. When held in chopped ice the ascorbic acid was very well retained for at least 4 days; after ice refrigeration, there was a loss of 18 percent within 24 hr., 24 percent after 4 days, and 39 percent after 7 days. At room temperature, there was about a 35-percent loss within the first 24 hr., after which the loss was not appreciable until the fourth day. After 7 days at room temperature, the destruction of ascorbic acid was complete and the kale was no longer in a usable state. These data suggest that the fourth day is the critical point in the deterioration of ascorbic acid in kale and that a cool, moist, quiet atmosphere is conducive to the best retention of the ascorbic acid.

The results showed that freshly harvested Jumbo and Hale Best cantaloups, stored under conditions similar to those used for kale, retained their initial ascorbic acid content (27 mg. per 100 gm.) very well for 4 days under any of the storage conditions. In chopped ice, there was practically no loss of ascorbic acid after 7 days; in the ice refrigerator, there was only a slight loss in this period; and at room temperature, there was approximately a 40-percent loss. In the cantaloups as well as in the kale, retention of appearance and palatability paralleled that of the ascorbic acid.

Relation of environmental and hereditary factors to ascorbic acid in cabbage. F. G. SMITH and J. C. WALKER. (Univ. Wis.). (*Amer. Jour. Bot.*, 33 (1946), No. 2, pp. 120-129).—The possibility of increasing the ascorbic acid content of cabbage by controlling certain environmental factors and by breeding was investigated. Preliminary sampling and chemical technics resulted in the development of a composite 3 slice method of sampling. A combination of Morell's and of Loeffler and Ponting's technic of extraction and analysis (with some modifications described) was used.

Data obtained (subjected to statistical treatment) led to the following conclusions: "No significant amounts of either dehydroascorbic acid or bound ascorbic acid were found in cabbage heads.

"Significant differences between varieties of cabbage were found to occur independently of fluctuation due to one or another environmental factor. Varieties in the early pointed group were in general higher than those in the early round and midseason round groups. The midseason flat varieties and some of the late flat varieties were the lowest in acid content.

"In a series of transplantings and harvests there was a tendency for heads in the August harvest to be higher than in either July or September harvest.

"In a series of closely related strains there was a highly significant increase in ascorbic acid content in one season over that in the previous season.

"No simple relation was found between ascorbic acid content and temperature, day length, or long-period light energy. The higher ascorbic values in the August harvest, mentioned above, may have been due to low rainfall preceding harvest.

"No correlation was found between stage of head maturity and ascorbic acid content.

"In contrast to previous reports the correlation for the error term which gave the measure of the average relationship between ascorbic acid content and head weight within varieties within a season was not significant.

"No correlation between soil fertility, yield, and ascorbic acid was noted.

"A study was made of inbred lines of Wisconsin All Seasons, a variety which contained 51 to 56 mg./100 gm. ascorbic acid. Lines were derived in which the acid content was not far removed from that of the parent variety, while one line was derived which yielded 80 to 91 mg./100 gm. When individuals from the high

yielding line were crossed with individuals from low yielding lines, the yields in the F_1 progenies were consistently intermediate between the two parents. The possibility of increasing the ascorbic acid content of standard varieties and combining it with disease resistance is discussed."

The nutritional status of college women as related to their dietary habits:

Vitamin stores: Thiamin, ascorbic acid (*Iowa Sta. Rpt. 1945, pt. 1, pp. 259-260*).—This phase of the study by P. P. Swanson et al. was concerned with the physiological availability of ascorbic acid in cabbage. The preliminary report here presented indicates that the six college women who served as subjects utilized the ascorbic acid in cabbage as well as they did an equivalent amount of the vitamin supplied in the diet in the form of pure crystalline ascorbic acid.

Effect of processing and storage on the quality and ascorbic acid content of sauerkraut, C. S. PEDERSON and H. G. BEATTIE. (N. Y. State Expt. Sta.). (*Food Packer*, 27 (1946), No. 8, pp. 44, 46, 48, 78, illus. 1).—Processing studies on sauerkraut revealed that effective pasteurization may be accomplished by filling containers at temperatures just high enough to remove excess CO_2 and to obtain sufficient vacuum in the can, that is, 155° to 165° F.

Various samples of kraut and kraut juice were fortified at different levels with ascorbic acid and stored at temperatures ranging from 32° to 131°. Flavor, color, texture, and ascorbic acid were found stable at 32° and 44.6°. However, as the storage temperature increased, losses in quality and in ascorbic acid increased.

Kraut packed in tin appeared to retain its ascorbic acid better than that packed in glass containers. Ascorbic acid added in tablet form to the container before filling was found more uniform in percentage retention after canning than kraut fortified by adding crystalline ascorbic acid to the preheating tank. Ascorbic acid showed some effect in inhibiting color changes.

Potatoes (*Nebraska Sta. Rpt. [1945], pp. 42-43*).—This report presents information on the factors affecting the ascorbic acid content of potatoes. Loss was rapid at a storage temperature of 40° F., but diminished as the temperature increased from 40° to 42.5°, 45°, 47.5°, and 50°. With temperatures of 60°, 75°, and 80°, the loss was possibly a trifle higher than at 50°. Losses in storage were more rapid with the immature potatoes from late plantings than from the more mature tubers. When potatoes with low ascorbic acid content (due to low temperature storage) were moved to room temperature for 6 weeks there was no indication of any increase in content.

Dehydroascorbic acid was found to be present to the extent of 5 to 8 mg./100 gm. of fresh tuber and there was no marked change in the amount throughout the storage period, but by late winter and later the amount was greater than that of the reduced form of ascorbic acid.

Total ascorbic acid content (dehydro plus reduced) of Nebraska potatoes in late winter and spring was found to be from 8 to 12 mg./100 gm. fresh weight.

The ascorbic acid content of Nebraska-grown potatoes as influenced by variety, environment, maturity, and storage, H. O. WERNER and R. M. LEVERTON. (Nebr. Expt. Sta.). (*Amer. Potato Jour.*, 23 (1946), No. 7, pp. 265-267).—This report is covered in the paper noted above and one noted previously (E. S. R., 95, p. 282).

Storage conditions which affect the vitamin C content of Maine-grown potatoes, E. MURPHY. (Maine Expt. Sta.). (*Amer. Potato Jour.*, 23 (1946), No. 6, pp. 197-218, illus. 3).—Six varieties of potatoes were held at 32°, 36°, 50°, 60° or 65°, and 70° F. for a period of 7 mo. for two successive seasons. Vitamin C determinations were made at regular monthly intervals during the storage periods. There was an average decrease from 22.7 to 6.3 mg. per 100 gm. during

the 7-mo. period, with one-third to one-half of the total loss occurring during the first month.

The higher temperatures of 50°, 60° or 65°, and 70° were conducive to larger retentions of vitamin C than 32° and 36°, and 60°, 65°, and 70° were not superior to 50°. The tubers remained of good quality at 50° and 36°, and with larger retentions of vitamin C at 50° the indications were that this storage temperature was superior to all others tested. The effect of storage on varietal differences was paralleled by its effect on seasonal variation. New tubers averaged 10.9 mg. higher in 1944 than in 1943; after 7 mo., the average difference was 2.3 mg. per 100 gm.

Ascorbic acid value of tomatoes canned by five home processing methods (*Louisiana Sta. Rpt. 1945, pp. 5-6*).—Two varieties of tomatoes, Marglobe and Dixie Gulf State Cross, were utilized in this canning study conducted by M. E. Hollinger and L. Johns. All lots, regardless of the method of processing, were canned in No. 2 tin cans. After scalding, peeling, and coring, each tomato was cut in five vertical sections and these distributed to each of the containers for five methods of processing, which included (1) packing of the cold fruit into the cans, heating to 180° F. by surrounding the cans with boiling water, sealing, and processing for 4 min. at 10 lb. pressure; (2) as above except that processing involved heating for 35 min. in a boiling water bath; (3) heating of the fruit to the boiling point in an aluminum saucepan followed by immediate packing and sealing of the cans and processing for 4 min. at 10 lb. or (4) for 10 min. in a boiling water bath; and (5) boiling the fruit for 20 min. in an open aluminum saucepan followed immediately by pouring into the cans and sealing. After storage for a few days at refrigerator temperature while initial ascorbic acid determinations were made on selected cans taken from the 18 packed by each method, the tomatoes were stored at room temperature pending final ascorbic acid determinations 6 mo. later. Similar vitamin retentions by the first four methods of processing were indicated by the initial and final analyses in which the ascorbic acid values for the several packs varied from 16.6 to 17.2 mg. and from 14.4 to 14.8 mg. per 100 gm. moist basis, respectively. The lot canned by the open kettle method contained 18.3 and 16.0 mg. of ascorbic acid per 100 gm. (moist basis) at the beginning and end of the storage period, respectively. Calculations on the dry basis indicated, however, that these higher values were due to concentration of the nutrients rather than a higher retention, and that actually there was a greater loss of the vitamin due to the longer boiling period. The flavor and appearance of the open kettle processed tomatoes was inferior to those processed by the other four methods. Cold packing resulted in larger head space than hot packing.

Home canned tomatoes (*Nebraska Sta. Rpt. [1945], p. 42*).—In tests with tomato home-canning methods, ascorbic acid losses from the fresh fruit to the processed tomatoes were significant. The decrease occurred as a result of blanching, processing, and storage, with the latter accounting for the largest total loss. Recommendations for minimum loss include short blanching periods and storing the product in quarts instead of pints. "In the open-kettle method at least 10 percent more evaporation of moisture takes place than in the hot- or cold-pack methods. Therefore, a 100-gm. serving of tomatoes canned by the open-kettle method will contain a greater original weight of fruit and will furnish more ascorbic acid than a 100-gm. serving of fruit of the same initial value but canned by other methods."

The effect of ripening, storage, and other methods of handling on vitamin C in apples. (*Iowa Sta. Rpt. 1945, pt. 1, pp. 263-264*).—This study by P. Swanson, H. H. Plagge, et al., here noted as a report of progress, indicates

that a method of sampling was worked out to give a picture representative of apples from the orchard as a whole. "A statistical analysis of the variation in the ascorbic acid content of lots composed of 20 apples made up of 5 apples from each quadrant of the orchard showed that, while apples picked from different quadrants in the orchard varied statistically in ascorbic acid content, the variation between means of lots composed of 5 apples from each quadrant was not statistically different." Of the 10 varieties of apples tested, all but 1 averaged about 5 mg. percent of ascorbic acid; the Willow Twig variety, however, contained about 25 mg. percent of this vitamin, which was retained very well through 7 mo. of storage at 32° F.

Varietal differences in the ascorbic acid value of strawberries (*Louisiana Sta. Rpt. 1945, pp. 6-7*).—In this study by M. E. Hollinger, standard and seedling varieties of strawberries produced in breeding trials were analyzed early, mid-way, and late in the bearing period in the seasons 1942, 1943, and 1944. Analytical data reported on the samples showed that during the 1942 and 1943 seasons, ascorbic acid values were highest in most cases early and late in the season. In 1944, however, the highest values were obtained at the midseason sampling. Although ascorbic acid values for each variety varied considerably, those varieties having the highest values remained consistently in the higher ranks while those having lowest values remained consistently in lower ranks. The Fairmore variety had, in most instances, the highest ascorbic acid value of all varieties tested, averaging 77 mg. per 100 gm., but a cross between two Blakemore-Klondike seedlings designated as 117-1 gave average results only slightly lower. The Klondike and Klommore varieties ranked rather consistently low, while the Konvoy variety was more variable. Average results of all determinations on these varieties were for Konvoy 62 and Klondike 58 mg. per 100 gm.

TEXTILES AND CLOTHING

The action of antiperspirant creams on fabrics, R. R. BIEN (*Toilet Goods Assoc., Sci. Sect. Proc., 1945, No. 4, pp. 8-12; also in Amer. Dyestuff Rptr., 35 (1946), No. 11, pp. 269-271, 290-291*).—A laboratory method is described for determining possible fabric destruction by cream type antiperspirants. After test application, the tensile strength of the treated material is determined against controls. A decrease of tensile strength, under the conditions of this test, indicates that up to 20 percent is allowable provided that the number of breaks showing a reduction in tensile strength over 20 percent does not exceed 5 out of a total of 25 tested.

The author concludes: "This investigation will have to be extended to a much larger group of products before any definite conclusion can be reached.

. . . The importance of every single ingredient in an antiperspirant cream formula may not be fully appreciated. The composition of the base material is fully as important as the proper balance of aluminum salt and buffer. To change any single ingredient, or its concentration, in a satisfactory formula, is to risk increasing the fabric destruction potential from a safe to a dangerous level."

Mildew and rot resistance of textile and effectiveness of textile fungicides: Tentative method (3rd revision—April 4, 1946) (*Amer. Dyestuff Rptr., 35 (1946), No. 11, pp. 274-276*).—Tentative methods are described for (1) determining the behavior of textiles with respect to mildew, and (2) evaluating the mildew preventives offered to the textile trade. Descriptions are given for the actual test procedures with their applications and interpretations in testing both the initial resistance of textiles and permanence of such resistance. The application of these tests in determining the fungicidal potency of mildew pre-

ventive compounds under uniform conditions and in determining their permence when applied to a standard fabric are also described.

Dimethylglyoxime-copper treatment for rotproofing fabrics, A. C. NEISH, G. A. LEDINGHAM, and A. G. MACKEY (*Canad. Jour. Rés.*, 23 (1945), No. 3, Sect. F, pp. 198-201, illus. 1).—"Copper was fixed in jute, coarse cotton, and woolen fabrics by dipping the test materials for 2 to 5 min. in a 0.5 percent aqueous solution of dimethylglyoxime at 90° to 100° C., and then immersing them in 5 percent copper acetate at room temperature for 5 min. The amount of fixed copper was varied by altering the strength of the copper solution. The treated fabrics were odorless, remained pliable, and were dyed a khaki color. As determined by soil burial tests, this treatment proved more effective than that with copper naphthenate for rotproofing purposes."

The soil burial test for rot-proofed cotton fabrics, J. D. DEAN, W. R. STRICKLAND and W. N. BEARD. (U. S. D. A.) (*Amer. Dyestuff Rptr.*, 34 (1945), No. 10, pp. 195-201, illus. 6).—As a means of determining the effectiveness of proofing treatments on fabrics exposed to soil burial after different intervals of exposure, protected and unprotected samples were subjected to breaking strength tests to measure their resistance to the cellulose-destroying activity of the soil. The tests described were made with triplicate burials of six specimens each, and although the average results were not considered absolute values, they were regarded as representative of the effect of soil temperatures and moisture. Other environmental factors which influenced the rate and extent of the rotting included the composition of the soil used and method of burying the sample; pH was not considered extensively as neutral soils were used throughout the tests. Copper naphthenate was used as a standard control proofing treatment against other commercial compounds. The results of the individual tests, expressed as resistance numbers which were derived from rot-resistance quality of the fabrics in view of their strength loss and length of burial, ranged from 36 to 46 days, averaging 42 days. It is considered that a resistance number of 42 days represents a norm of control-fabric rotting under standard testing conditions. Under these conditions, a well protected cotton fabric weighing 6 to 8 oz. per square yard normally required 3 weeks' burial in fresh soil before significant deterioration occurred. Lighter fabrics were more rapidly attacked, and less effective treatments may be detected after a week or two of soil contact. Several of the copper compounds employed in the rot proofing of the cotton textiles were found responsive to the influences that produced accelerated rotting.

Mould growth on leather, A. J. MUSGRAVE (*Chem. and Indus. [weekly]*, No. 24 (1946), pp. 226-227).—The author reviews (19 references) the mycological problems of the leather industry and the prevention of mold growth by alterations in processes of handling and manufacture and by use of poisons or fungicides.

REPORTS AND PROCEEDINGS

Annual report of the director [of Delaware Station], 1945, G. L. SCHUSTER (*Delaware Sta. Bul.* 259 (1945), pp. 43).—Brief reports are made of progress results in agronomy, including tests of improved strains of grasses, varieties of wheat, soybeans, barley, and oats, pasture management, corn hybrids, fertilizer placement for soybeans and corn, and minor elements for corn; animal husbandry, including work with improved strains of poultry, dehydrated vegetable wastes in poultry feeds, hatchability of eggs, effect of moisture on sporulation of coccidia, value of sulfonamides and other treatments in coccidiosis and fowl typhoid control, transmission of fowl typhoid by turkey buzzards and flies, viability of

fowl typhoid organisms, rations for finishing broilers, litter management, and roughage consumption in dairy cows; chemistry, including factors inducing jellying of pectin, and ascorbic acid losses in frosted kale; entomology, including mosquito observations, control of bean and cucurbit insects, ethylene dichloride emulsion for control of peach-tree borer, control of Japanese beetles and European corn borers, and miscellaneous insect notes; horticulture, including fertilizer and variety tests with potatoes, including resistance to leafhoppers, certified v. home-grown potato seed, and whole v. cut potatoes, fertilizer, cultural, breeding, and variety tests with tomatoes, fertilizer v. variety tests with cantaloups, variety tests with sweet corn, sweetpotatoes, cucumbers, and watermelons, hormone sprays for lima beans and tomatoes, fertilizers for lima beans, poultry manure for strawberries, injury to apples by methyl bromide fumigation, and thinning apples and peaches with Elgetol; plant pathology, including chemical control of wilt in sweetpotato sprouts, production of strawberries resistant to red stele, factors influencing leaf blights of corn, control of diseases of soybeans, lima beans, and extensive studies of new fungicides and synthetic organic chemicals.

Annual Report [of Florida Station], 1945, H. Mowbray. (Partly coop. U. S. D. A.). (*Florida Sta. Rpt. 1945*, pp. 229+, illus. 22).—In addition to items noted elsewhere in this issue, brief progress reports are given on the various projects of the station, substations, and field laboratories. Among the many projects for which data are reported are those in agronomy, including studies on peanut, oat, tobacco, and corn improvement, crop rotations, variety tests with millet, Sudan grass, oats, sugarcane, Bermuda grass, cotton, and cowpeas, pasture fertilizers, crop varieties, and grazing tests, effect of burning on range plants, pasture legumes, effect of environment on composition of forage crops, fertilizer, cultural, and variety tests with tobacco, fertilizer and cultural tests with peanuts, and sulfur dusting of peanuts and cotton; animal industry, including ensilability of urea and sorghum and of grapefruit pulp, cause of infectious bovine mastitis, inversion of sucrose for ice cream making, effect of citrus press cake silage on milk flavor, condensed buttermilk and peanut meal in laying rations, beef production on carpet grass, periodic v. continuous lighting for egg production, sulfurization of soil to control poultry parasites, composition of Florida waters, use of DDT to control horn flies, toxic principle of the tung tree and tung meal, cause and treatment of "swollen joints" in range calves, dehydrated celery tops, tung meal, and grazing crops for poultry, and effect of diethylstilbestrol on milk production; entomology, including control of nut and leaf casebearers of pecans, cutworms and armyworms, nematode control by resistant seed strains, mulches, and soil fumigants, cane sirup and honey for baits on thrips, and tests of DDT for control of Colorado potato beetle, melon and pickle worms, chinch bug, and other insects; home economics, including vitamin activity of various foods, especially Florida fruits and vegetables, chemical composition and properties of royal jelly, and relation of the school lunch to health and progress; horticulture, including culture of tung trees, values of manganese for crepe myrtle, cover crops and potash for pecans, minor elements for peas and grapes, the splitting of Bermuda onions, cold storage of citrus fruits to check diseases, freezing of citrus juices and hearts, effect of soil reaction on broccoli and peppers, fumigation of narcissus bulbs, minor elements for cabbage, cultural requirements of the mu oil tree and hybrids, zinc, magnesium, potash, boron, naphthaleneacetic acid, and naphthaleneacetamide for pecans and zinc-bordeaux v. zinc-manganese-bordeaux as sprays, plicoilm and other wrappers and packages for tomatoes, carrots, and other vegetables, variety tests of beans, sweet corn, onions, and lettuce, composition of Florida-grown cabbage, carrots, and other vegetables as affected by environment, irrigation of sweet corn, and freezing of Florida vegetables; plant pathology,

including host relations and factors influencing the growth, parasitism, and control of *Sclerotium rolfsii*, seed and soil treatments with cowpeas, lettuce, spinach, tomatoes, beans, lima beans, and squash, studies of phomopsis blight and fruit rot of eggplant, azalea flower pot, rhizoctonia damage to lima beans, snap beans, and cabbage, camellia dieback, witches'-broom of oleanders, dusts for cucumbers and lupines, and pythium root rot of Easter lily; soils, including studies of microbial action in fine sand soils, soil analyses, factors affecting the growth of legume bacteria and nodule development, role of maintenance of soil reaction and organic matter and significance of levels of readily soluble major nutrient elements, correlation of soil characteristics and pasture crop response, fertilizer tests for cabbage, and availability of various phosphates; celery investigations, including soil and fertilizer studies, variety tests with potatoes and sweet corn, and cover crops; potato investigations, including disease control, variety tests with potatoes and cabbage, downy mildew of cabbage, and potato and cabbage culture and fertilizer tests; watermelons and grapes, including fusarium wilt and other fungus diseases of watermelons and fruit rots of grapes; vegetable crops, including prevention of seedling injury in tomatoes, variety tests of tomatoes, onions, corn, and beans, breeding for resistance to tomato diseases and insects and to downy mildew in cucumbers, control of lepidopterous larvae on corn, factors influencing manganese and iron deficiencies, cover crops, lime, and sulfur for vegetable crops, control of mole crickets, value of DDT for control of cabbage insects, leafhoppers on peas, pepper weevil, bean leaf roller, and tomato and potato insects, rapid soil fertility tests, organic fungicides for foliage diseases of tomatoes and cucumbers, gladiolus culture, salinity and fertility levels in soils, and ammonium sulfamate and 2,4-D as herbicides; range cattle, including studies of wintering beef cattle, improving flatwoods pastures with fertilizer and minor elements, and weight changes and mineral consumption by range cattle; at the Subtropical Station, cultural studies with Tahiti limes, avocados, mahogany and balsa seedlings, papayas, mangoes, annonas, ginger, pineapples, and other fruits, leaf spot of papaya and fruit spot of white sapote, potato and tomato culture and fertilizers, cover crops, control of potato late blight and ring rot, cercospora spot and fruit rot of avocados, mango anthracnose, and tomato blight and root necrosis, variety tests of cantaloups, cauliflower, sweet corn, cucumbers, onions, rice, strawberries, and carrots, dasheen culture, diseases and nitrate requirements of Tahiti limes, salt content of wells and soils, high nitrate content in Perrine marl, waxing of tomatoes and potatoes, and sclerotinose disease of beans and varietal resistance to it; at the Citrus Station, storm losses to citrus fruit, studies of melanose and stem-end rot, citrus nutrition and fertilizers, timing of oil sprays, control of scale insects and mites, so-called "spreading decline," addition of color to fruits, control of stem-end rot and mold fungi with thiourea and 8-hydroxyquinoline sulfate, oil sprays for citrus, soil moisture studies, and fertilizer tests; at the Everglades Station, meteorological data, studies of soil and water conservation, machinery for decorticating *Sansevieria* fiber, an improved moling machine, value of superphosphate for oranges, and copper sulfate for corn on new sawgrass peat, control by DDT and other insecticides of bean leafhopper, bean leaf roller, cabbageworm, potato insects, corn earworm, mole cricket, American cockroach, horn fly, stablefly, onion thrips, weevils, and insects in hospitals, soils tests and treatments, fertility studies with potatoes and celery, water control, weed killers, mineral requirements of cattle, response to sulfur of celery and lettuce and to manganese of potatoes, control of sugarcane moth borer, sugarcane breeding, beef production in the Everglades, pasture improvement, cultural studies with sugarcane, barley, and other cereals and grasses, corn, soybeans, *Sansevieria*, ramie, and sirup and forage canes, seed treatment

of potatoes, fungicides for beans, control of leaf blights of potatoes, peas, beans, and tomatoes, analyses of celery and carrot leaves and stems and broccoli and collard leaves as potential sources of dehydrated feeds, control of brown root rot, virus diseases and early blights of celery, cutworms and armyworms, variety tests with snap beans, lima beans, cabbage, sweet corn, potatoes, and tomatoes, and value of shallu, blackstrap molasses, and sweet potatoes for steers on winter pasture; at the North Florida Station, meteorological data, studies of disease-resistant varieties of tobacco, cover crops for pecan orchards, germination and early growth of tobacco seedlings, performance of Columbia sheep, breeding corn, oats, barley, wheat, velvetbeans, and sorghum, value of kudzu as a grazing and hay crop, control of downy mildew of tobacco, ground oats for fattening steers, tobacco rotations, swine-feeding tests, methods of seeding lupines, varieties and strains of peanuts, sweet potatoes, cotton, lespedeza, potatoes, corn, cotton, and oats, and fertilizer tests with corn, cotton, peanuts, pastures, and lupines; and at the West Central Station, grazing tests with cogon and Bahia grasses.

Report on agricultural research [of Iowa Station] for the year ending June 30, 1945, I, II, R. E. BUCHANAN et al. (Partly coop. U. S. D. A.). (*Iowa Sta. Rpt. 1945, pts. 1, pp. 355, illus. 68; 2, pp. 91, illus. 18*).—In addition to several items abstracted elsewhere in this issue, part 1 contains special reports on Apple Breeding at the Iowa Station, by B. S. Pickett (pp. 21–26); and Oat Improvement at the Iowa Station Through a 40-Year Period, by H. D. Hughes (pp. 27–46). There are also the customary reports on projects as carried on in the section of agricultural engineering, including farm building losses due to wind and fire, atmospheric exposure tests of wire and fencing, utilization of cornstalks for building insulation and of steel in farm building construction, methods of harvesting and storing hay, storage and distribution of manure, growing row crops and maintaining a surface mulch of crop residues, milling of hemp, adapting farm buildings to meet changes in farm operations, development of machines for peat land and terrace construction, and curing hay in the mow by mechanical ventilation; agronomy, including studies of technics in seed analysis, varietal response to cultural methods with oats and wheat, comparison of sweetclover species, varieties, and strains, variety tests of soybeans, barley, and flax, improvement of brome grass, oats, barley, wheat, soybeans, orchard grass, birdsfoot trefoil, grasses and legumes for soil conservation, hemp culture and improvement, adaptation of soybeans to local conditions, pasture improvement and management, development of lespedeza, clovers, alfalfa, and Kentucky bluegrass, carotenoid content of orchard grass, effect of hail damage on soybeans, soil microstructure in relation to soil tilth, availability of phosphorus and potassium in soils, fertilizer response on different soil types with corn, oats, and alfalfa, characteristics of Iowa soil types, influence on soils of mineralogical nature of clays and aggregates, effect of cultural practices on soil moisture, crop rotations for hardpan soils and silt loam, sweetclover in short rotations, soybean production in relation to fertilizers, effect of cover crops, contouring, crop residues, and cropping systems on soil and water conservation and crop yield, nitrogen fixation by soybeans, the retting of hemp, management of peats, sands, and other soils for truck crop production, wartime needs for agricultural lime, evaluation of drainage installations, liming and fertilizer for slowly drained lands, methods for spectrochemical analysis of soils and plant materials, and relation of the soil profile to level terraces; animal husbandry, including studies of inbreeding in Holstein-Friesian cattle, Poland-China hogs, and other pure breeds, value of the Danish Landrace breed for swine improvement, production of sterols and their role in nutrition, relation of vitamin E to sheep and poultry, evaluation of swine breeding stock, growth measurements of colts, brucellosis in swine, systems of

feeding lambs, soybeans and soybean products for milk production, physiology of digestion in fore stomachs of calves, preservative effect of carbon dioxide on meats in storage, inbreeding and crossing in fowls, effect of ration and fattening period on poultry, association of so-called nonspecific enteritis of chickens with fowl leucosis, mode of inheritance of resistance and transmission of the iritis type, storage changes in dried egg albumen, post mortem changes in the poultry carcass, wheat germ oil as a supplement to poultry rations, microbiology of frozen eggs, factors affecting functional properties of reconstituted dried eggs, and use of baled straw for temporary poultry houses; bacteriology, including the function of carbon dioxide in bacterial metabolism, conditions for optimal yield of 2,3 butylene glycol, mechanism of vitamin action in micro-organisms, and fermentation production of nitrogenous yeast feeds from corn mash; botany and plant pathology, including breeding for disease resistance in melons, parasitism of the rusts, smuts, and other diseases of oats, propagation of disease-free sweet-potato seed stock, pink root and neck rot diseases of onions, plant ecology in waterfowl breeding areas of Iowa, influence of chloropicrin seed treatment on stands and yield of peas, flax, oats, barley, and wheat, effect of seed treatment on strains of sugar beets, hill culture crops and methods (especially sumac for tannin), control of potato late blight, scab, and other diseases, black stem rust (by barberry eradication), tests of *Asclepias* sp. and other rubber-producing plants, control of the oak wilt fungus, diseases of barley, soybeans, and brome-grass, and fungi as sources of protein supplements for feeding; chemistry, including studies of antibiotic peptides and inhibition by amino acids on dextrose to check deterioration of dried eggs; dairy industry, including studies of dairy bacteria, the acids in butter, the mechanism of formation of acetylmethylcarbinol, the ripening of cheese, and the vitamin A and beta-carotene contents of Iowa butter; economics and sociology, including the existence and significance of specific agricultural cycles, analysis of farm records, economic use of farm credit resources, adjusting transportation to wartime needs in livestock marketing, land market controls, wartime shifts in farm organizations and management problems concerned with dry milk solids production in Iowa, agricultural price control after the war, programs to expand domestic consumption, improvement of Iowa farm leasing agreements, place and grade differentials in hog prices, and neighborhood and community extension technic as a means to maximize agricultural production; entomology and economic zoology, including the influence of meteorological factors on honey production, insecticides and insect toxicology, control of potato insects with DDT and other insecticides, screwworm infestation, DDT for control of cucurbit insects and codling moths, factors involved in honey production from nectar, management of quail, ducks, and pheasants, ecology of the muskrat, resistance of honeybees to American foulbrood, cottontail rabbit production, and control of nonmigratory grasshoppers and sweetclover weevils; foods and nutrition, including studies of the leavening power of dried whole milk and the defrosting and cooking of frozen beef; forestry, including the control of white pine blister rust, survival of tree seedlings under grass competition, and the amounts and grades of lumber from white elm, cottonwood, and red oak; genetics, including studies of breeding for resistance to fowl typhoid and typhoidlike diseases, genetics of virulence in the mouse typhoid organism, radiation effects on genes, bacteria, and viruses, polyploidy in tomatoes, and heterosis in *Drosophila*; horticulture, including studies of the maintenance of fine turf grasses, tests of garden annuals and herbaceous perennials for heat resistance and adaptability to cut flower production, responses of greenhouse plants to Iowa soil types and soilless culture, propagation of apple stocks, soil management for apple orchards, breeding of apples, pears, plums, and peaches, hybridization of black raspberries for

immunity to anthracnose, influence of stock on scion in apple production, breeding rose stocks, freezing fruits and vegetables in refrigerated locker storages, responses of fruit to treatments before and during storage, placement of apple trees with soil erosion terraces, controlled dehydration in the home, and effect of ripening, handling, and storage on thiamine and riboflavin content of apples, potato and onion breeding, shrinkage of sweetpotatoes in storage, fertilizers for sweetpotatoes and cantaloups, varieties of snap beans, sweetpotatoes, and cantaloup, vegetable production on muck and peat soils, and optimum storage conditions in the household refrigerator for frozen soybeans, corn, and peaches; statistical methods, including studies of methods for yield determination in experimental plats, examination of climatological data, a national sample of farms, use of lattice designs, the A. O. A. C. chick method of assay for vitamin A, and relative pounds of ear corn and shelled corn; textiles and clothing, including studies of the protection from degradation by certain finishes on cotton cellulose, regenerated cellulose, and cellulose-acetate rayon, and uses of hemp in textile fabrics, vocational education, including an evaluation of the Iowa State College curriculum in agriculture; studies of farm tenancy; and observations on plantings of *Trifolium ambiguum*, creeping alfalfa, longevity of red clover seed, and spreading habits of wild carrot.

Part 2 is the tenth annual report of the Iowa Corn Research Institute. Following an article entitled Popcorn Breeding in Iowa, by J. C. Eldredge and I. J. Johnson (pp. 7-16), reports are given on soils and soil management, including comparative value of different phosphate fertilizers; rotation and fertilizer studies, and chemical tests for determining fertilizer needs; cultural methods and equipment, including those for storage and curing corn and silage, weed control, tests of hybrids, and influence of pathological factors on seed germination; corn breeding, including the genetic transfer of starch characteristics, development of pure inbred lines, sweet corn and popcorn breeding, and hybrid production; botany, including physiological studies of hybrids, crosses, and inbreds, synthesis and translocation in the corn plant, and interactions of water, growth hormones, and food supplies; pathology and mycology, including resistance to *Ustilago zeae*, measuring disease resistance in corn and related species, and methods of combating diseases of corn, oats, and potatoes; insects, including the chinch bug and European corn borer and their control; chemistry and composition of corn, including methods of analysis, studies of starch, protein, and vitamins; industrial utilization, including technics for cornstarch production; corn and corn products in human and animal nutrition, including tests of corn and corn silage in full v. limited grain feeding, and nutritive value of shelled corn as affected by storage.

Fifty-eighth annual report [of Kentucky Station], 1945, T. P. COOPER (*Kentucky Sta. Rpt. 1945*, pp. 68).—In addition to items abstracted on pages 894 and 895 of this issue, this report notes briefly progress on the following: Farm land values in Kentucky, capital investments and income in farming, farm management on grass farms, prices in Kentucky and the United States, distillers' wheat dried solubles as a protein supplement and bluegrass-molasses silage v. alfalfa-molasses silage for fattening steers in dry lot, digestibility of distillers' corn dried solubles, alfalfa, bluegrass, and corn silages and barn-cured v. field-cured alfalfa for pregnant and lactating ewes, continuous v. rotational grazing, pastures for finishing, and grain rations for lambs, yearling weight and performance of western ewes, survival of nematode parasites of sheep on pasture, distillers' wheat and corn dried solubles for pigs, alternate v. continuous grazing of bluegrass pastures by dairy heifers, bacterial extract vaccine for mastitis, distiller's wheat dried solubles as a protein supplement for dairy cows, effect of age of hens on eggs, vegetable protein for laying pullets, crooked keel bones, osteopetrosis, and an un-

identified osteoma in chickens, control of poultry lice with DDT, analyses of cases of equine abortion and infection of newborn foals, and histopathology of non-infectious diseases, in coordination of horses (wobbles), penicillin for horses, occurrence of *Salmonella* and paracolon bacteria, arsenic, boron, and manganese in animal nutrition, corn hybrids and improvement, hybrid popcorn, corn borer life history and parasites, hardiness in winter oats, variety tests of oats, barley, wheat, rye, red clover, and lespedeza, production of hay and Kentucky bluegrass seed, control of plant bugs, wireworms, and green June beetles, fertilizers for pastures, corn, tobacco, and orchard grass, use of a barn hay drier, effect of crop residues on soil nitrates, methods of fertilizer application for wheat, corn, and tobacco, tests of the Neubauer culture method for soil P and K, mechanical fractionation of soils, tobacco diseases including *Fusarium* wilt, steak, frogeye, root rots, and mosaic, overwintering of *Salmonella typhimurium*, priming and curing Burley tobacco, nutritional value of tobacco seed, production of nicotine from green tobacco and nicotinic acid by nicotine oxidation, variety tests of lima beans, tomatoes, and sweet corn, control of codling moth, plum curculio, apple scab, phloem necrosis, oriental fruit moth, Japanese beetles, and May beetles, peach pruning systems, strawberry mulching, pasture experiments, distillers' wheat dried solubles v. soybean oil meal for steers, vegetable v. animal protein for pullets, rate of phosphate applications, top dressings for alfalfa, grass variety tests, apple cover crops, variety tests of apples, peaches, plums, blackberries, and strawberries, and production of sorghum sirup and mine props.

Research in Agriculture: Annual Report [of the Louisiana Station, 1945]

W. G. TAGGART ET AL. (Partly coop. U. S. D. A.). (*Louisiana Sta. Rpt. 1945*, pp. 144, illus. 2).—In addition to findings on the ascorbic acid content of tomatoes and strawberries noted on pages 898 and 899, this report presents data on nutrition research, including the carotene content of sweetpotatoes, the vitamin A content of milk and butter, nature of the lipid microbiological growth stimulants found in rice polish, experimental lathyrism from Singletary peas, detoxification of tung meal, and toxicity of the tung nut; food preservation, including studies of freezing strawberries, frozen shrimp and its packaging, loss of added vitamin C in storing frozen peaches, use of frozen potatoes for French fries, and tests of strawberry and peach varieties for freezing; agricultural economics, including economic aspects of peach production in Louisiana, the mechanization of cotton production in upland areas, tractors on upland farms in north Louisiana and cost of operating tractors and other mechanical equipment in Delta areas of Louisiana, farm management and cost studies with sugarcane, milk, and sweetpotatoes, wartime production capacity on Louisiana farms, cottonseed and cotton marketing, and prices and statistics; agricultural engineering, including studies of electric hotbeds, mechanical diggers, and dehydrators for sweetpotatoes, flame cultivators, effect of cover crops and deep plowing on crop yields and soil loss, rice storage in steel bins, and mole drainage of sugarcane land; animal industry, including swine breeding, management of beef cattle pastures, and winter grazing, soybean meal and peanut meal for pigs, and fertilizing pastures on old rice land; crops and soils, including a 12-mo. grazing program, effect of fertilizer on cotton fiber quality, Dallis grass improvement and seed production, effect of depth of application of nitrogen on the rice crop, sugarcane fertilizer, crop rotation, fertilizer practices, including tests with oats, corn, and cotton, and corn varieties and hybrids; dairy research, including mineral deficiencies of Louisiana herds, inherited tolerance to heat, night grazing in hot weather, effect of high humidity and temperature, pasture improvement with manure and fertilizer, and value of early-cut hay for dairy cattle; entomology, including the use of DDT-nicotine dust on cabbage, control of the sand wireworm,

velvetbean caterpillar on soybeans, cotton boll weevil, cotton aphid, sugarcane borer, turnip aphid, onion thrips, and tomato fruitworm and early blight, and tests with DDT against American and German cockroaches, fleas, the brown dog tick, and flies; home economics, including studies of food habits and dental conditions; horticultural research, including sweetpotato breeding, industrial use, carotene content, and waxing in storage, breeding potatoes, strawberries, pole and lima beans, and gladiolus; plant pathology, including hot-water treatment for sugarcane, control of nematodes by soil treatment and of mildew and anthracnose of cucumber by Fermate, control of black scale disease of lily bulbs, weed control with 2, 4-D, control of Blakemore yellows of strawberry and blight of arborvitae, rice disease studies (use of fertilizer in root rot and white tip and fungicides for rice seeds), a new race of *Cercospora oryzae* on Rexoro rice, control of soil rot and black rot of sweetpotatoes, vegetable seed treatments, soil treatment for shallot white rot, and losses from mildew on shallots and onions; poultry research, including importance of green feed, farm egg coolers and frequent marketing, improvement by breeding, and coccidiosis control; rural sociology, including medical personnel, facilities, and services in Louisiana, the educational status of Louisiana's farm population, and population composition and changes; sugarcane, including tests of varieties; veterinary science, including studies of Johne's disease, anaplasmosis, gastrointestinal nematode parasites in cattle, *Crotalaria spectabilis* poisoning of livestock, and "pinkeye" treatment in cattle; and at the substations, strawberry varieties and use of lime and fertilizers, pepper and okra breeding, corn varieties, fertilizers, and spacing, varieties and spacing of sorghum, cotton varieties and fertilizers, varieties of Sudan grass and tomatoes, sweetpotato fertilizers and varieties, peach fertilizers, hogging off corn, green feed for hens, turkey production in north Louisiana, rice fertilizers, rotations, varieties, and use of calcium arsenate, substitutes for rotenone and pyrethrum on cole crops, sweetpotato weevil studies, bee culture, potato breeding, corn hybrids, cotton diseases (especially fusarium wilt) and varieties, and varietal resistance to sweetpotato diseases.

Fifty-ninth Annual Report [of Nebraska Station, 1945], W. W. BURR. (Partly coop. U. S. D. A.). (*Nebraska Sta. Rpt.*, [1945], pp. 119, illus. 23).—In addition to findings noted elsewhere in this issue, this report presents results in soils research, including erosion control and moisture conservation, crop residue management, fertilizers for corn, wheat, barley, bromegrass and other grasses and alfalfa, nitrate production in soils after grasses, infiltration of irrigation water, and alkali in soils; field crops, including rotations, variety tests of wheat, barley, oats, sorghum, and corn (hybrids), pollination of grasses and seed production, time of cutting prairie hay, improvement of birdsfoot trefoil, milk vetch, crown vetch, Korean lespedeza, sweetclover, alfalfa, soybeans, safflower, castorbeans, and sesame, seed production in sweetclover, and 2,4-D for control of bindweed, hoary cress, Russian knapweed, Canada thistle, whiteweed, tanweed, and other weeds; horticultural crops, including storages for seed potatoes, potato culture, breeding, ascorbic acid content, heat resistance, and cracking, ascorbic acid content of tomatoes, tomato breeding, variety tests with sweetpotatoes, lima beans, walnuts, and apple stocks, rotations, supplemental water for orchards, and orchard spraying; plant diseases, including tests of sprays for control of halo blight in beans, seed treatments of oats, wheat, sorghum, and barley, resistance to leaf rust of wheat, charcoal rot of corn and sorghum, mold in stored corn, cornstalk rots, phloem necrosis of elms, pine twig blight, seed piece rot, pink rot, blackleg, late blight, scab, and an unidentified disease of potatoes, blight, leaf spot, bacterial speck of tomatoes, and bacterial spot of peppers; chemistry, including studies of amylases and their inhibitors and the protein-digestion in-

hibitor in raw soybeans; insects, including tuber flea beetles and aphids on potatoes, use of airplanes for applying dusts and sprays, field tests of DDT and other materials, control of chinch bugs, hessian fly, grasshoppers, corn rootworms, corn borers, onion thrips, and pine tip moth, DDT for fly and bedbug control, control of chicken mites, and greenhouse pests; animal husbandry, including tests of distillers' solubles and substitutes for alfalfa meal for pigs in dry lot and their protein requirements, relation of sorghums to lithiasis, anascara, and pathological liver condition in cattle, distillers' dried grains and solubles and safflower meal for wintering steer calves and fattening steers, use of pasture for finishing cattle, and progeny testing of rams; dairy husbandry, including studies of factors affecting reproduction, artificial insemination, protein supplements in a calf starter, carotene content of Nebraska grasses, cheese making, vitamins in cheese and butter, and ice cream stabilizers; poultry husbandry, including studies of the marketing point for turkeys, estrogens for fattening cockerels, protein utilization by chicks and poults, and vitamin D irradiation of chicks; animal diseases, including studies of swine erysipelas and mortality in turkey flocks; agricultural engineering, including work on heating drinking water for livestock, weed control, improvements in farm refrigeration and freezers, thermostats for potato storage, emergency methods of cooling milk and cream, machinery for seedbed preparation for corn, and corn drying methods; rural economics, including studies of cost of producing crops, farm organization, land use planning, land tenure, and farm credit; home economics, including studies of blood regeneration by donors and farm lighting; and at the substations, studies of supplements to prairie hay for wintering calves, potato breeding, crop rotations, lamb feeding tests and origin of lambs as related to urinary calculi, variety tests of wheat, oats, barley, corn, and sorghum, weed control with 2,4-D, range cattle feeding, and pump irrigation.

Fifty-eighth Annual Report [of Cornell Station], 1945, W. I. MYERS ET AL. (Partly coop. U. S. D. A.). ([*New York*] *Cornell Sta. Rpt. 1945*, pp. 81-169).—In addition to work noted elsewhere in this issue, this section of the report deals with the progress of investigations in agricultural economics, including an analysis of methods and practices involved in the distribution of apples and competitive fruits in New York City by chain and independent retailers, the elasticity of the demand for corn and oats, costs of milk processing and distribution, and farm-labor simplification; agricultural engineering, including exposure tests of fence wires and paints; agronomy, including the properties of New York peat and muck deposits, relation between physicochemical properties of New York soils and their response to fertilization, potash requirements of leguminous forage crops, studies of birdsfoot trefoil, methods of improving feed crops in New York State, and plant associations for permanent pastures; animal husbandry, including the technic of artificial insemination, effect of curing methods on feeding value of hay, nutritive value of timothy hay at three stages of maturity, carotene and vitamin A requirements of the dairy calf, nutritional requirements of herbivora, protein levels and supplements for lambs, cause of stiff-lamb disease, and methods for fattening calves; botany, including weed control with borax, plant sources of rubber, and germination of vanilla seed and hybrids; dairy industry, including the nicotinic acid, pantothenic acid, and biotin content of milk, survival of *Bacillus abortus* in cheese, keeping quality of pasteurized milk, studies of disinfectants and antiseptics, methods for determining chlorides in milk, ascorbic acid oxidation of milk fat, deaeration of milk, endospore formation in *B. mycoides*, the cytoplasmic membrane of the bacterial cell, nutrition and varieties of streptococci bacteria, and subacute endocarditis; entomology and limnology, including the control of lettuce yellows

through control of the aster leafhopper, studies of the onion thrips, squash bug, flea beetle on tomato transplants, alfalfa snout beetle, white grubs, European chafer, and seed-corn maggot, control of sheep ticks and flies with DDT, control of potato insects, studies of the small-mouth bass, insecticidal constituents of the yam bean, selcnates for pest control on florist crops, and fumigants for red spider mite in greenhouses; floriculture and ornamental horticulture, including the correlation of quick tests with rose growth in the greenhouse, soil mixtures for roses, snapdragon and leaf scorch, effect of cutting time on the keeping of roses, pruning *Spiraea vanhouttei*, and seed dormancy in cabbage; plant breeding, including genetic studies with barley, oats, and wheat, breeding wheat, oats, barley, corn for silage and grain, cabbage, soybeans for grain and food, celery, zigzag clover, red clover, other forage legumes and grasses, beans, cucumbers, melons, and potatoes; plant pathology, including studies of the X-virus of potatoes, development of immune or disease-resistant stocks, potato scab, rugose mosaic, leaf roll, and golden nematode disease of potatoes, control of celery blights, onion smut, gray mold and drop of lettuce, spraying and dusting of fruit trees, soil fumigants, and fungicides for apple scab; pomology, including influence of soil type on fruit plants, control of preharvest drop of apples, influence of blossom sprays and thinning on annual bearing of apples, thinning peaches by sprays, and storage studies on apples; poultry husbandry, including genetic resistance to avian leucosis, poultry requirements for the vitamin B complex, and value of choline, milk byproducts, and dehydrated grasses for poultry; rural sociology, including social participation of rural families, types of families residing on marginal and submarginal land, the rural community in wartime, and attitudes of farm women toward rural cooperative organizations; vegetable crops, including soil reaction studies for potatoes, vegetable crops for muck and irrigated soils, lettuce improvement, fertilizer studies with potatoes, potato storage on Long Island, rapid methods for diagnosing nutritional disorder and fertilizer needs of vegetables, and control of weeds in vegetable crops; and zoology, including methods for the control of starlings.

Fifty-eighth Annual Report of the South Carolina Experiment Station, [1945], H. P. COOPER ET AL. (Partly coop. U. S. D. A.). (South Carolina Sta. Rpt. 1945, pp. 166, illus. 35.)—In addition to articles noted elsewhere in this issue results are presented of research in agricultural economics, including consumer preference for tree-ripened peaches and small packages, seasonality of cotton gin operations, efficiency in cotton production, and labor requirements for sweetpotatoes; agricultural engineering, including studies of mulch farming, tillage methods for corn following winter cover crops and to control erosion, and mulch farming v. clean tillage for cotton and oats; field crops and fertilizers, including variety tests of corn, oats, wheat, and soybeans, pH levels for oats and lespedeza hay, lime and fertilizer for white clover in pastures, and nitrogen sources for cotton; fruits and vegetables, including variety tests of peaches and pears and culture of Turkish tobacco; plant physiology and plant diseases, including mineral nutrition and wilt resistance in cotton, cotton and sweetpotatoes as reciprocal hosts of wilt fungi, Mexican clover as a carrier of the sweetpotato wilt fungus, control of the root knot nematode by soil fumigation, cotton and corn seedling diseases, breeding cotton varieties resistant to bacterial blight, fungi attacking fruits of cayenne pepper, and miscellaneous plant diseases; insects, including control of the rice weevil in stored corn and cowpeas, the cowpea curculio, oriental fruit moth, studies of honey-yielding plants, causes of bitter honey, DDT for fly control in dairy barns, summer squash insects, corn earworm, and Mexican bean beetle on beans; animal husbandry, including tests of sweetpotatoes for fattening swine, control of kidney worms in swine, cobalt content of pasture grasses and

forage crops, and protein content of wheat; dairying, including grazing helpers on sericea lespedeza and urea-treated v. untreated corn silage for lactating cows; poultry, including the sufficiency of vitamin E in standard chick rations and Korean lespedeza meal as a supplement in breeding rations; at the Coast Station, studies of pasture fertilizers, establishing kudzu on cut-over coastal pine land, Bermuda v. Dallis grass for erosion control on drainage canal spoil banks, and lespedeza sericea for hay on fire lines; at the Pee Dee Station, production studies of grain sorghums and tobacco, cayenne pepper and soybean varieties, plow sole application of fertilizer, mechanical cotton chopping, cotton breeding and genetics, control of boll weevil and cotton aphid, curing flue-cured tobacco, DDT for control of tobacco hornworm, tobacco budworm, tobacco flea beetle, and the tree cricket *Oicanthus nigricornis*, and dusts for tobacco blue mold; at the Sandhill Station, kudzu for grazing lactating cows, nitrogen sources, potash salts, acid-forming v. nonacid-forming fertilizers, and sodium chloride v. potassium chloride, all for cotton; at the Truck Station, tests of new cabbage selections, improved varieties of paprika, lettuce and potato fertilizers, size of Katahdin seed potatoes and seed pieces and relation of spacing to yield, early v. late-emerging potatoes, and factors influencing potato scab; and at the Edisto Station, sweetpotato plant production, varieties of cotton, corn, oats, wheat, and barley, and cotton mechanization studies.

Twenty-sixth annual report [of the State of California Department of Agriculture for] period ending December 31, 1945 (*Calif. Dept. Agr. Bul.*, 34 (1945), No. 4, pp. 141-108+, illus. 3).—This report presents findings for the year in the divisions of plant industry, including the bureaus of entomology and plant quarantine, plant pathology, rodent and weed control and seed inspection, field crops, and chemistry; animal industry, including the bureaus of livestock disease control, dairy science, meat inspection, and livestock identification; and economics including the bureaus of markets, market enforcement, market news, milk control, agricultural statistics, fruit and vegetable standardization, shipping point inspection, and weights and measures.

MISCELLANEOUS

California agriculture, edited by C. B. HUTCHINSON (*Berkeley: Univ. Calif. Press; London: Cambridge Univ. Press*, 1946, pp. 441+, about 60 illus.).—According to the editor's preface, "this is a story of California agriculture from the days of the Spanish missions to the middle of the twentieth century. It depicts particularly the rise of agriculture in an arid and semiarid land through the aid of science and engineering skill. It has been written as one of a series of volumes prepared in commemoration of the seventy-fifth anniversary of the founding of the University of California and records in some degree the contributions made by the university to the development of the agriculture and rural life of the State."

The successive chapters deal with The Historical Background of California Agriculture, by F. Adams (pp. 1-50); Wealth Pyramiding in the Production of Livestock, by G. H. Hart et al. (pp. 51-112); The Rich Pattern of California Crops, by W. P. Tufts et al. (pp. 113-238); Protecting Plants From Their Enemies, by R. E. Smith et al. (pp. 239-315); Exploring the Soils of California, by H. Jenny et al. (pp. 317-393); and The Economic and Social Structure of California Agriculture, by M. R. Benedict (pp. 395-435).

Mississippi Farm Research [March-April 1946] (*Miss. Farm Res. [Mississippi Sta.]*, 9 (1946), Nos. 3, pp. 8, illus. 6; 4, pp. 8, illus. 6).—In addition to the

monthly meteorological notes and several articles noted elsewhere in this issue, these numbers contain the following:

No. 3.—The Demand and Price Situation, by D. G. Miley (pp. 1, 8); Factors in Family Food Preparation, by D. Dickins (pp. 3-7), also to be published as a station bulletin; Field Shocked Sorghum as a Feed for Wintering Beef Cattle, by S. P. Crockett (pp. 1, 8); and Pasture Crops Require Adequate Supplies of Plant Food, by H. W. Bennett (pp. 1, 8).

No. 4.—Development of the Dairy Manufacturing Industry in Mississippi, by D. W. Parvin (p. 1); The Vitamin A Potency of Mississippi Creamery Butter, by F. H. Herzer and M. Gieger (pp. 3-4, 5), also to be published as a station bulletin; Better Living for Farm Families by Industrialization, by D. Dickins (p. 5), an abstract of Bulletin 364 (E. S. R., 87, p. 321); Mississippi Cash Farm Income for 1945, by D. W. Parvin (pp. 1, 6); Trends in Cotton Production in Mississippi, by H. P. Todd (pp. 6-7); and Milk and Butterfat Prices, 1929-1944, by D. W. Parvin (pp. 1, 8).

Foreign Agriculture [August-September 1946] (*U. S. Dept. Agr., Foreign Agr.*, 10 (1946), Nos. 8, pp. 105-120, illus. 5; 9, pp. 121-136, illus. 1).—No. 8 includes the following articles: Chile's Pattern of Agricultural Production and Trade, Part 1, by P. L. Guest (pp. 106-114), and Agricultural Ruthenia, by F. S. Straus (pp. 114-120). No. 9 contains Cuban Agricultural Policy, by P. G. Minneman (pp. 122-128), and Chile's Pattern of Agricultural Production and Trade, Part 2, by P. L. Guest (pp. 128-136).

Tentative directory of agricultural periodicals, societies, experiment stations, and schools in Latin America (*Washington, D. C.: Pan. Amer. Union, Div. Agr. Coop.*, 1945, pp. 90+).

The agricultural development of the Middle East, B. A. KEEN (*London: Govt.*, 1946, pp. 126+, illus. 17).—This is a report to the Director General of the Middle East Supply Centre as a part of the survey for the Scientific Advisory Mission. It outlines the present status of Middle East agriculture by territories, and discusses the obstacles to agricultural improvement, methods of raising agricultural standards, scientific and technical problems, and the supply and development of agricultural information and advice.

NOTES

California University and Station.—Dr. William B. Herms, head of the division of entomology and parasitology for 23 years and associated with the institution since 1908, has retired.

Colorado College and Station.—Dr. Nellie E. Goldthwaite, associate professor of home economics research from 1919 until her retirement in 1925 and a pioneer worker in home economics research, died in South Hadley, Mass., on November 25 aged 83 years. A recipient of the Ph. D. degree from the University of Chicago in 1904, she served as head of the chemistry department of Mt. Holyoke College from 1897-1905 and as associate physiological chemist in the Rockefeller Institute from 1906 to 1908. In the latter year she was appointed assistant professor in household science in the University of Illinois, and in 1915 became head of the department of home economics in the University

of New Hampshire. Among her research projects were those dealing with the chemistry and physics of jelly making, the principles of bread making, and the chemical composition of Colorado potatoes.

University of Minnesota.—The board of regents of the university has accepted a gift of \$15,000 to establish The Conway MacMillan Memorial Research Fellowship in Botany, Charles J. Brand, 1902, Founder, with an annual stipend of \$1,200. The fellowship is available annually to doctoral students in botany having the master's degree from the University of Minnesota or institutions of similar standing. According to the terms of the gift, special mention is made of those from the University of Chile and the Catholic University of Chile. Mr. Brand plans to add to the fund, and hopes to interest other men and women who were trained by Professor MacMillan in making the fellowship permanent. A. Stanley Holt, Rhode Island State College, 1930, has been chosen as fellow for the first year; his field of research, leading to the doctorate, is the evolution of oxygen by chloroplasts in the presence of oxidizing agents. The founder of the fellowship is best known for his 20 years' work in the U. S. Department of Agriculture in research, administrative, and consultative capacities, his most recent service there having been as coadministrator of the Agricultural Adjustment Administration in 1933.

Office of Experiment Stations.—The retirement on December 31 is noted of Howard L. Knight, editor of *Experiment Station Record*, and Martha C. Gundlach, in charge of indexes. Mr. Knight had been associated with the Office since 1904, most of that and the following year being in connection with its nutrition investigations at Wesleyan University. Coming to Washington in 1906, he was assistant editor of the *Record* until 1918, associate editor until 1923, and subsequently editor of volumes 50 to 95, inclusive.

Miss Gundlach came to the Office in 1920. She had prepared volume indexes for volumes 42 to 93, inclusive, as well as combined indexes for volumes 26-40, 41-50, 51-60, and 61-70.

Dr. S. H. Work, animal husbandman in the Office of Foreign Agricultural Relations, has been appointed experiment station administrator (animal husbandry).

U. S. Department of Agriculture.—Reuben Brigham, assistant director of the Extension Service since 1937 and associated with the Department since 1917, died in Chicago on December 5 in his fifty-ninth year. A native of Massachusetts and a graduate of Maryland University in 1908, he served there as secretary to the president, editor, and agent in charge of the boys' club work and news service for 5 years beginning in 1913. In the Department he had been an assistant in publications in the States Relations Service and in charge of visual instruction and educational work in the Extension Service. He was president of the American Association of Agricultural Editors in 1924-25.

Association of Land-Grant Colleges and Universities.—The sixtieth convention of this association was held in Chicago from December 16 to 18, with the customary preliminary sessions. The revised constitution and by-laws adopted in 1945 became effective. Under the new plan of organization, the retiring president, Dean T. P. Cooper of Kentucky, became chairman of the executive committee for the ensuing year. President R. D. Hetzel of Pennsylvania was elected president of the association and vice chairman of the executive committee and Dean Russell I. Thackrey of the Kansas College executive secretary, the latter with headquarters in Washington, D. C.

INDEX OF NAMES

v

- Aase, H. C., 648.
 Abbenhaus, G. E., 758.
 Abbot, C. G., 166.
 Abbott, E. V., 514, 674.
 Abbott, J. B., 682.
 Abbott, O. A., 272.
 Abbott, O. D., 886.
 Abdel-Malek, Y., 553.
 Abelson, L. C., 242.
 Åberg, E., 200, 656.
 Abraham, E. P., 483.
 Abrahamsen, M. A., 263, 408.
 Abrams, E., 435.
 Abrams, L., 638.
 Ackerman, R. A., 192.
 Ackerson, C. W., 378, 547, 846.
 Ackert, J. E., 388.
 Acree, F., Jr., 155.
 Acuña, J. B., 197, 811.
 Adams, F., 910.
 Adams, G., 265, 272.
 Adams, J. A., 361, 687.
 Adams, J. B., 360.
 Adams, J. C., 758.
 Adams, J. E., 460.
 Adams, J. R., 632.
 Adams, J. V., 108.
 Adams, M., 762.
 Adams, M. F., 300.
 Adams, R. K., Jr., 4.
 Adsuar, J., 217.
 Ahalt, A. M., 731.
 Ahlgren, G. II., 504, 507, 805.
 Aikman, J. M., 475.
 Ainsworth, G. C., 315.
 Albanese, A. A., 20, 128, 593, 736, 737.
 Alberts, J. O., 100, 391.
 Albertson, F. W., 167.
 Albin, F. E., 75.
 Albrecht, W. A., 183, 272, 782.
 Albury, M., 890.
 Alcaraz Mira, E., 483.
 Alcock, A. W., 470.
 Alcorn, J. R., 682.
 Alder, B., 757.
 Alder, H., 300.
 Alderfer, R. B., 784.
 Alderman, D. C., 123.
 Alderman, W. H., 331.
 Alderton, G., 609.
 Aldrich, J. W., 522.
 Aldrich, W. W., 203.
 Alexander, A. E., 242.
 Alexander, C. P., 534, 687.
 Alexander, T. L., 289, 290, Alexander, W. M., 116.
 Alhadeff, R., 716.
 Alicata, J. E., 564.
 Allaway, W. II., 481.
 Allee, R. II., 447.
 Allemann, R., 417.
 Allen, H. B., 876.
 Allen, H. R., 13.
 Allen, N. N., 850.
 Allen, R. G. D., 590.
 Allen, R. W., 387, 718.
 Allen, T. C., 675.
 Allington, W. B., 212, 339.
 Allison, F. E., 480, 811.
 Allison, J. B., 592.
 Allison, J. L., 822.
 Allison, L. E., 785.
 Allman, S. L., 686.
 Almquist, H. J., 235.
 Alonso, R. E., 197.
 Alpert, E., 419.
 Alswager, J. II., 91.
 Althouse, P. M., 5.
 Amdur, M. O., 421.
 Amidon, E. P., 418.
 Ammal, E. K. Janaki, 648.
 Andersen, E. M., 215.
 Anderson, A. A., 299.
 Anderson, A. K., 296.
 Anderson, C. M., 747.
 Anderson, C. P., 140, 760.
 Anderson, D. A., 84.
 Anderson, E., 658.
 Anderson, E. B., 554.
 Anderson, E. J., 531.
 Anderson, E. O., 98.
 Anderson, G. W., 508.
 Anderson, H., 574.
 Anderson, J., 265.
 Anderson, J. A., 592, 762.
 Anderson, J. P., 34, 484.
 Anderson, L. W., 589.
 Anderson, M. S., 681.
 Anderson, P. J., 662, 669, 670.
 Anderson, R. K., 127, 427.
 Anderson, T. F., 757.
 Anderson, W. A., 119, 587, 854, 873, 874.
 Anderson, W. S., 287, 804.
 Andersson, G., 486.
 Andre, F., 142, 447, 759.
 Andreea, W. A., 266.
 Andrewes, C. H., 683.
 Andrews, A. C., 451, 609.
 Andrews, E. D., 233.
 Andrews, F. N., 46, 91, 234, 717.
 Andrews, F. W., 513.
 Andrews, H. L., 357.
 Andrews, W. B., 804.
 Angelo, E., 332.
 Annand, P. N., 141.
 Anson, M. L., 646.
 Anthony, J. L., 287.
 Appleman, C. O., 492.
 Appling, J. W., 302.
 Arana, F. E., 162.
 Arbuckle, W. S., 621.
 Arceneaux, G., 811.
 Archer, J. C., 631.
 Archibald, E. S., 756.
 Archibald, J. G., 545.
 Area Ieao, A. E., 698.
 Ark, P. A., 513, 673, 798.
 Armentrout, W. W., 118.
 Armitage, H. M., 538, 695.
 Armitage, R. H., 433.
 Armstrong, T., 223, 693.
 Armstrong, T. V., 239.
 Armstrong, W., 590.
 Arndt, L. E., 756.
 Arnold, L. K., 156.
 Arnold, M. R., 146.
 Arnstein, H. R. V., 314.
 Arny, A. C., 328.
 Arroyo, R., 22.
 Arthur, G. H., 563.
 Artschwager, E., 790.
 Aschner, M., 647.
 Asdell, S. A., 855.
 Asenjo, C. F., 745.
 Ashby, E., 639.
 Ashley, T. E., 332.
 Ashton, G. C., 376.
 Asmundson, V. S., 710.
 Atkeson, F. W., 892.
 Atkin, L., 762.
 Atkins, C. D., 138.
 Atkins, I. M., 336, 819.
 Atkins, S. W., 728.
 Atkinson, F. E., 603.
 Atkinson, I. S., 269, 271.
 Atkinson, L. J., 725.
 Atkinson, R. E., 336.
 Attaya, M. B., 277.
 Attoe, O. J., 668.
 Atwood, F., 111.
 Atwood, S. S., 39, 186.
 Ault, C. N., 700.
 Ault, W. C., 4, 454, 457, 462.
 Axelrod, A. E., 744.
 Axelrod, H. E., 601.
 Babcock, H. E., 760.
 Back, E. A., 838.
 Badger, C. J., 632.

- Badger, E. H. M., 755.
 Badgett, C. O., 6.
 Baechle, J. W., 76.
 Baer, H., 180.
 Balles, E. L., 304.
 Bailey, A. E., 452, 453, 455, 456, 458, 460.
 Bailey, C. H., 291, 438, 606.
 Bailey, D. L., 271.
 Bailey, E. M., 122, 313.
 Bailey, F., 760.
 Bailey, J. S., 533.
 Bailey, K. H., 108.
 Bailey, L. F., 152.
 Bain, D. C., 819, 829.
 Baines, R. C., 58.
 Baker, A. D., 212.
 Baker, D. W., 543.
 Baker, G. A., 508, 517.
 Baker, G. L., 122, 413, 883.
 Baker, J. A., 562, 563.
 Baker, K. F., 218, 335, 347, 516, 675, 691, 819.
 Baker, L. C., 136.
 Baker, M. L., 111.
 Baldwin, J. L., 310.
 Baldwin, W. P., Jr., 524.
 Bale, W. F., 300, 763.
 Ball, C. D., 765.
 Ball, E., 641.
 Ball, R. F., 97, 326, 548.
 Ballard, W. W., 502.
 Ballinger, W. R., 77, 778.
 Balls, A. K., 762.
 Balock, J. W., 84.
 Banerjee, S., 747.
 Banfield, W. G., 494.
 Bangham, R. V., 77.
 Bannan, M. W., 650.
 Baragar, A., 139.
 Baragar, A. E., 285.
 Barclay, C., 509.
 Bardes, C. L., 388.
 Bare, O. S., 83.
 Barker, C. A. V., 717.
 Barker, H. A., 4, 878, 879.
 Barlow, F. D., Jr., 114, 116.
 Barmore, M. A., 306.
 Barnes, H. V., 333.
 Barnes, L. A., 716.
 Barnes, R. C., 366.
 Barnes, S., 365.
 Barnett, S. A., 75.
 Barnicoat, C. R., 556, 557, 703.
 Barott, H. G., 96.
 Barr, G. W., 111, 581.
 Barreda, E. A., 88.
 Barron, E. S. C., 762.
 Barrons, K. C., 49.
 Barshad, I., 733.
 Barss, H. P., 62, 142.
 Barter, P. G. H., 590.
 Barthel, W. F., 14, 149, 222, 298.
 Bartholomew, E. T., 10, 154.
 Bartlett, K. A., 441.
 Bartlett, L. M., 361.
 Bartlett, P. D., 8.
 Barton, G. T., 259.
 Barton Mann, T., 106.
 Barton-Wright, E. C., 32.
 Bartow, M. L., 734.
 Baselt, F. C., 713.
 Basinger, A. J., 536.
 Bassett, C. F., 521, 558.
 Batchelor, L. D., 205.
 Bateman, G. Q., 726.
 Bateman, I., 133.
 Baten, W. D., 121, 735.
 Batjer, L. P., 50, 51.
 Batson, F. S., 180.
 Baudisch, O., 29.
 Bauer, F. C., 632.
 Bauer, S. T., 456, 457.
 Bauernfeind, J. C., 160.
 Baumann, C. A., 128, 431.
 Baur, F. J., Jr., 295.
 Bawden, F. C., 340, 341, 672.
 Baxter, D. V., 209.
 Bayfield, E. G., 281, 306, 813.
 Bayley, C. H., 604.
 Bazan de Segura, C., 671.
 Beach, J. R., 720.
 Beach, R., 272.
 Beadle, G. W., 761.
 Beament, J. W. L., 352.
 Beamer, P. D., 715.
 Beamer, R. H., 353.
 Bean, H. W., 93, 292.
 Bear, F. E., 29, 174.
 Beard, D., 718.
 Beard, J. W., 718.
 Beard, R. L., 221, 354.
 Bearer, E. V., 758.
 Heath, O. A., 559.
 Beattie, H. G., 897.
 Beatty, A. V., 37.
 Beaudette, F. R., 860.
 Beck, G. H., 144.
 Beckel, A. C., 457, 769.
 Becker, D. E., 845.
 Becker, W. W., 301.
 Beckwith, C. S., 84.
 Bedenbaugh, P. G., 233, 846.
 Bedford, C. L., 418, 853.
 Beegle, J. A., 874.
 Beer, W. J., 672.
 Beers, H. W., 409, 873.
 Beers, N. R., 167.
 Beeson, K. C., 29, 632.
 Beeson, W. M., 92, 377.
 Beljerinck, M. W., 489.
 Beinhardt, E. G., 461.
 Belding, T. C., 896.
 Bell, F. C., 206.
 Bell, F. G., 631.
 Bell, G. D. H., 444.
 Bell, J. M., 377.
 Bell, L. E., 109.
 Bell, R., 300.
 Bell, R. W., 47, 385, 722.
 Bell, T. T., 85.
 Bellamy, W. D., 179, 769.
 Bellemere, E. R., 79.
 Belter, P. A., 769.
 Belval, H., 184, 673.
 Benedicks, C., 309.
 Benedict, F., 140.
 Benedict, M. R., 910.
 Benedict, R. G., 32.
 Benne, E. J., 10, 29, 675.
 Bennett, C. A., 572.
 Bennett, C. W., 826.
 Bennett, F. T., 672.
 Bennett, H. H., 26, 311.
 Bennett, H. W., 371, 804, 911.
 Bennett, J. P., 29.
 Bennett, M. J., 622.
 Bennett, M. K., 581.
 Bennett, O. L., 414.
 Bentley, L. S., 597.
 Benton, R., 758.
 Berard, W. N., 900.
 Bergelm, O., 618.
 Bergström-Kjellander, I., 217.
 Bernardo, D. J., DI, 108.
 Berner, L., 830.
 Berry, A. G. V., 519.
 Berry, J. A., 418.
 Berry, L. J., 559.
 Berry, L. N., 706.
 Berry, R. O., 246.
 Berrymann, G. H., 589.
 Berta, J. A., 68.
 Bertone, E., 285.
 Bessey, O. A., 127, 600, 626.
 Best, C. H., 762.
 Best, R. J., 213.
 Betts, C. A., 333.
 Bevan, L. A., 758.
 Beveridge, J. M. R., 727.
 Beyer, J. J., 38.
 Bhargava, K. S., 484.
 Biale, J. B., 666.
 Bianchi, F. A., 830, 831.
 Bick, G. H., 533.
 Bickerton, J. M., 820.
 Bickford, W. G., 298.
 Bickoff, E., 465, 466.
 Biehler, R., 627.
 Bien, R. R., 899.
 Bieri, J. G., 739.
 Bierly, I. R., 579, 870.
 Bierman, R. W., 582.
 Bigger, J. H., 502.
 Bilbey, C., 424.
 Billen, G. N., 294.
 Bills, R. W., 63.
 Bingham, M. L., 895.
 Binkley, W. W., 301.
 Birch, L. C., 226, 533.
 Bird, F. H., 550.
 Bird, H. R., 95, 547.
 Bird, O. D., 624.
 Birdseye, M., 505.
 Birkeland, C. J., 144.
 Birkeland, J. M., 32.

- Blaby, G. R., 815.
 Bishop, A., 227.
 Bishopp, F. C., 85.
 Bitancourt, A. A., 679, 681.
 Bjornseth, E. H., 860, 677.
 Black, D. J. G., 190.
 Black, H. C., 121.
 Black, J. D., 724.
 Black, L. M., 257.
 Blackford, F. W., 679.
 Blackith, R. E., 357.
 Blagoveschensky, D., 228.
 Blair, M. G., 801.
 Blake, I. H., 219.
 Blake, M. A., 816.
 Blakeslee, E. B., 839.
 Blanch, G. E., 730.
 Blanch, G. T., 726.
 Blanks, R. F., 571.
 Blaringham, L., 39.
 Blaser, R. E., 810.
 Blattner, R. J., 101.
 Blauvelt, W. E., 356.
 Blaxland, J. D., 566.
 Blexter, K. L., 701, 712.
 Bledsoe, R. P., 24, 502.
 Bledsoe, R. W., 339.
 Blewett, M., 685.
 Bliss, C. I., 757, 802.
 Bliss, D. E., 209.
 Bloch, K., 761.
 Blodgett, E. C., 58, 835, 819, 827.
 Blom, R. H., 164, 767.
 Blondeau, R., 491, 796.
 Bloor, W. R., 182.
 Blore, I. C., 565.
 Blosser, J. H., 113.
 Blumer, C., 88.
 Boals, G. P., 581.
 Boatner, C. H., 14, 452.
 Bobko, E. V., 35, 184.
 Bodenstein, D., 852, 530.
 Bodenstein, O. F., 685.
 Boebel, F. W., 720.
 Bogart, R., 800.
 Boggs, M. M., 418.
 Bohart, R. M., 77, 87.
 Bohren, B. B., 775.
 Boley, L. E., 238.
 Bolin, D. W., 92, 94, 470.
 Bolin, F. M., 756.
 Bollenbacher, K., 484.
 Bollenback, C. H., 313.
 Bolt, R., 483.
 Bolton, J. L., 192, 224.
 Bond, C. A., 121.
 Bond, E., 105.
 Bond, E. W., 568.
 Bondi, A., Jr., 30.
 Bonnen, C. A., 112.
 Bonner, D., 422.
 Bonner, J., 323.
 Bonner, J. F., 800.
 Bonner, J. F., Jr., 763.
 Bonner, J. T., 38.
 Bonnet, F., 434.
 Bonnett, O. T., 198, 199.
 Bonney, V. B., 7.
 Bonser, H. J., 404.
 Bonsma, F. N., 496.
 Boolj, H. L., 514.
 Bookhout, B. R., 111.
 Booth, R. G., 190.
 Booth, V. H., 17.
 Borchardt, L. F., 266.
 Borchers, R. L., 445.
 Borden, R. J., 782.
 Borders, H. I., 336.
 Borlaug, N. E., 511.
 Borman, E. K., 244.
 Borsook, H., 419.
 Borthwick, H. A., 795.
 Borts, I. H., 101.
 Boshell-Manrique, J., 228.
 Bostian, C. H., 606.
 Botsford, R. C., 352.
 Bouet, G., 336.
 Bourne, A. I., 89, 533.
 Bourque, J. E., 737.
 Boutwell, R. K., 272, 454.
 Bowden, J. P., 612.
 Bowditch, J. B., 726.
 Bowers, J. L., 186, 815, 888.
 Bowman, D. H., 210.
 Bowser, P. H., 357.
 Boyce, A. M., 225.
 Boyd, I. L., 322.
 Boyd, J. M., 417.
 Boyd, W. L., 245, 854.
 Boyes, J. W., 186.
 Boyle, L. W., 516.
 Boynton, D., 816.
 Boynton, W. H., 857.
 Brabson, J. A., 151.
 Brackett, E. E., 111.
 Brackett, G. L., 475.
 Brackett, S., 387.
 Bradbury, D. E., 418.
 Bradford, E. A. M., 280.
 Bradford, H. E., 111.
 Bradford, M. J., 387.
 Brady, D. E., 123.
 Brain, E. D., 639.
 Bramble, W. C., 205.
 Branaman, G. A., 703.
 Brand, C. J., 912.
 Brand, E., 1, 2.
 Brandes, G. A., 211.
 Brandly, C. A., 567.
 Brandon, J. F., 818.
 Brandow, G. E., 729.
 Brandt, A. D., 140.
 Brandt, K., 581.
 Branlon, H. D., 551, 552.
 Branton, C., 238.
 Brasher, E. P., 266, 664.
 Bratton, A. C., Jr., 251.
 Bratton, A. W., 829.
 Braucher, O. L., 205.
 Braude, R., 233.
 Brauer, A., 361.
 Braun, O. G., 125.
 Braun, W., 232, 390, 560.
 Bray, R. H., 174, 175.
 Breakay, E. P., 77, 218.
 Breed, R. S., 684.
 Bregetova, N., 228.
 Brehm, C. E., 446.
 Breneman, W. R., 189.
 Brennan, J. M., 700.
 Brentzel, W. E., 336.
 Breslow, L., 243.
 Bressler, B., 624.
 Bressman, E. N., 447.
 Brett, C. H., 832.
 Bretz, T. W., 335.
 Brewer, N. R., 567.
 Brian, P. W., 207, 637.
 Briant, A. M., 412, 889.
 Brice, B. A., 454.
 Bricker, M., 592.
 Bridger, G. L., 176.
 Brieger, E. M., 101.
 Brierley, P., 216, 819.
 Briggs, A. P., 136.
 Briggs, D. R., 292, 467, 769.
 Briggs, G. M., 253, 549, 567.
 Briggs, G. M., Jr., 616.
 Briggs, H. M., 373, 374, 756.
 Brigham, R., 912.
 Brindley, T. A., 83.
 Brink, R. A., 193.
 Britton, J. W., 100, 393, 558, 560.
 Broadbent, D. A., 726.
 Broadhurst, W. L., 570.
 Brodell, A. P., 870.
 Brodie, H. J., 60.
 Brody, J. K., 265, 304.
 Broh-Kahn, R. H., 252.
 Brokaw, W. H., 111.
 Bromley, S. W., 355.
 Bronkhorst, J. J., 715.
 Bronson, T. E., 690.
 Brooks, E. M., 23.
 Brooks, J. S., 195, 754.
 Brooks, T. J., 272.
 Brossier, J. C., 272.
 Brothers, W. C., 87, 368, 540, 697.
 Brown, B. E., 198.
 Brown, C. A., 504.
 Brown, C. T., Jr., 667.
 Brown, D. S., 202.
 Brown, E., 201.
 Brown, E. B., 670.
 Brown, E. F., 132.
 Brown, E. O., 49.
 Brown, H. B., 194.
 Brown, H. L., 220.
 Brown, J. B., 295.
 Brown, J. E., 88.
 Brown, J. W., 320.
 Brown, L. H., 260.
 Brown, M., 267.
 Brown, R., 316.
 Brown, R. A., 284, 624.

- Brown, R. E., 19.
 Brown, R. G., 180, 492.
 Browne, H. H., 16, 304.
 Browning, D. R., 476.
 Brownstein, B., 567.
 Bruce, C. S., 108.
 Bruce, D., 181.
 Bruce, W. G., 839.
 Bruckart, S. M., 602.
 Bruening, C. F., 16.
 Brues, C. T., 77.
 Brun, E., 309.
 Bruner, D. W., 853.
 Bruner, S. C., 532.
 Bruner, W. E., 182.
 Brunner, E. deS., 760.
 Brunson, A. M., 659.
 Bruyn, Ouboter, M. P. de, 74,
 75, 514.
 Bryan, C. S., 104, 245, 391,
 851.
 Bryan, H. S., 391, 851.
 Bryan, P., 523, 526.
 Bryan, R. E., 608.
 Bryant, C. B. A., 713.
 Bryant, J. C., 170.
 Bryant, L. R., 345.
 Bryant, R. L., 710.
 Bryce, W. A., 415.
 Bubl, J. L., 162.
 Buchanan, R. E., 903.
 Buchbinder, L., 713.
 Buchholz, W. F., 828.
 Buck, R. E., 161.
 Buddie, M. B., 244.
 Budolfson, M., 285.
 Buechele, A. C., 266.
 Bueding, E., 761.
 Buer, A. W., 716.
 Buhner, E. M., 69.
 Bull, W. C., 460.
 Bullough, W. S., 652.
 Bundgaard, R. C., 23.
 Bunyea, H., 860.
 Buras, E. M., Jr., 10, 149.
 Burck, C. R., 477.
 Burdick, E. M., 166.
 Burdick, R. T., 253, 287, 868.
 Buren, W. F., 366.
 Burgess, E. A., 784.
 Burgwald, L. H., 99, 239, 385,
 714.
 Burke, E. M., 397.
 Burkhardt, G., 692.
 Burmester, B. R., 396.
 Burnett, R. S., 2, 163, 164.
 Burr, G. O., 465, 627.
 Burr, H. S., 640.
 Burr, W. W., 111, 907.
 Burrell, A. B., 827.
 Burrill, M. W., 596.
 Burris, R. H., 314.
 Burroughs, R., 367.
 Burroughs, R. J., 406.
 Burroughs, W., 841.
 Burrows, H., 188.
 Burstein, H. N., 21, 150, 303.
 Burström, H., 183.
 Burt, J. H., 387.
 Burt, R. B., 176.
 Burton, G. W., 805.
 Bush, M. T., 634.
 Buss, I. O., 682.
 Butcher, F. G., 328.
 Butler, B., 179.
 Butler, C. G., 89.
 Butlin, K. R., 60.
 Butterfield, C. T., 100.
 Buxton, A., 721.
 Byers, H. R., 308.
 Byrne, J. L., 244.
 Bywater, T. L., 374.
 Calcedo, A. R., 104.
 Cagle, L. R., 835.
 Cain, J. C., 607.
 Cairy, C. F., 652.
 Čajlachjan, M. C., 34, 185.
 Calavan, E. C., 346, 347.
 Caldwell, A. B., 599.
 Caldwell, A. C., 312.
 Caldwell, E., 131, 137.
 Caldwell, J. S., 122, 123, 270,
 882.
 Caldwell, M. J., 156, 382.
 Caldwell, M. L., 762.
 Caldwell, R. M., 224, 500.
 Caldwell, T. P., 163.
 Cale, G. H., 702.
 Call, L. E., 445.
 Callan, E. M., 77.
 Callison, E. C., 470, 598.
 Callow, R. K., 313.
 Calvert, E. L., 69.
 Calvery, H. O., 418.
 Calvet, E., 640.
 Camlen, M. N., 14, 15, 618,
 619.
 Camp, A. F., 20, 272, 332.
 Camp, T. R., 108.
 Campbell, A. D., 390.
 Campbell, C. J., 234, 624.
 Campbell, D., 373, 374.
 Campbell, H., 418, 879.
 Campbell, H. L., 275, 598,
 739.
 Campbell, H. M., 855.
 Campbell, J. C., 67, 690.
 Campbell, J. G., 396, 397.
 Campbell, K. S., 484.
 Campbell, M. A., 63.
 Campbell, W. A., 679.
 Campbell, W. D., 373, 374.
 Campbell, W. G., 544.
 Camplon, H., 590.
 Canavan, F. T., 131.
 Cantino, E. C., 10, 771.
 Caravella, M., 14.
 Card, C. G., 705.
 Card, L. E., 189, 234, 846.
 Cardon, P. V., 140, 608, 760.
 Carleton, E. A., 311.
 Carleton, W. M., 144.
 Carlson, A. E., 505.
 Carlson, F. N., 856.
 Carlson, F. W., 77.
 Carlson, J. P., 53.
 Carlson, J. W., 804.
 Carlson, R. F., 51.
 Carollo, J. A., 224, 698.
 Carolus, R. L., 888.
 Carpenter, C. G., 870.
 Carpenter, C. W., 829.
 Carpenter, D. C., 2, 319, 764.
 Carpenter, S. J., 77, 533, 700.
 Carpenter, T. M., 594.
 Carr, R. B., 287.
 Carr, R. S., 503.
 Carrigan, J. E., 286.
 Carroll, D., 169.
 Carroll, W. E., 43, 845.
 Carruth, L. A., 361.
 Carson, J. F., 294.
 Carter, D. G., 257.
 Carter, E. P., 291.
 Carter, G. F., 181.
 Carter, J. C., 335.
 Carter, R. H., 300.
 Carter, R. M., 579, 728, 733.
 Carter, W. H., 504.
 Cartwright, O. L., 354.
 Cartwright, W. B., 224, 500.
 Carver, J. S., 550, 705.
 Cassel, E. G., 412.
 Cassell, R. C., 58, 335, 386,
 819.
 Cassil, C. C., 156.
 Castle, W. E., 652.
 Cathart, C. S., 816.
 Catlin, G., 724.
 Catlin, M., 724.
 Caulfield, W. J., 99.
 Caulum, V., 446.
 Causey, O. R., 228, 700.
 Cavanaugh, W. W., 99.
 Cavers, J. R., 755.
 Cavert, W. L., 579.
 Cecil, S. R., 126, 413.
 Cerf, W. W., 176.
 Chadderton, A. E., 309.
 Chaigneau, M., 636.
 Chaikoff, I. L., 771.
 Chalmers, E. A., 266.
 Chamberlain, D. W., 822.
 Chamberlain, R. W., 533, 698,
 700.
 Chamberlin, J. C., 83.
 Chamberlin, R. V., 351.
 Chamberlin, V. D., 847.
 Chamberlin, W. J., 532.
 Chance, F. S., 446.
 Chandler, W. H., 779.
 Chapel, H., 681.
 Chapin, D. S., 157.
 Chaplin, C. A., 182.
 Chapman, R. A., 415.
 Charkey, L. W., 157.
 Charles, A. M., 435.

- Chase, F. E., 252.
 Chase, F. J., 111.
 Chase, H. B., 350.
 Chase, J. T., 281, 602.
 Chastain, S. M., 10.
 Chaudhuri, S. D., 644.
 Chauvin, R., 225.
 Cheldellin, V. H., 160, 279, 622.
 Chen, L., 431.
 Chen, S. M., 749.
 Chen, T.-T., 494.
 Cheng, C. S., 57.
 Cheo, K.-H., 668.
 Chepil, W. S., 172, 479.
 Cherednichenko, A. F., 184.
 Cherry, W. B., 716.
 Chester, K. S., 336, 757, 819.
 Chevalier, G., 39.
 Chiasson, L. P., 188.
 Childers, N. F., 26.
 Chin, Y.-C., 685.
 Chipault, J. R., 627.
 Chisholm, R. D., 77, 152.
 Chitty, D., 220.
 Chitwood, B. G., 69.
 Choix, M., 636.
 Choudhri, R. S., 649.
 Choussy, F., 372.
 Christiansen, J. E., 785.
 Christensen, B. E., 153.
 Christensen, C. M., 508.
 Christie, G. I., 286.
 Christie, J. R., 348.
 Chucka, J. A., 198.
 Clandinin, D. R., 548.
 Clark, A. G., 546.
 Clark, C. F., 103, 503, 717.
 Clark, F., 884.
 Clark, F. E., 635.
 Clark, J. H., 124, 879.
 Clark, K. G., 482, 632.
 Clark, N., 441.
 Clark, N. M., 272.
 Clark, R. T., 375, 842, 845.
 Clark, T. B., 235.
 Clark, W., 387.
 Clarke, A. E., 793.
 Clarke, H. T., 128.
 Clarke, I. D., 164.
 Clarke, R. A., 153.
 Clarke, S. E., 755.
 Clarke, W. S., Jr., 311, 506.
 Clausen, D. F., 19.
 Clausen, R. T., 792.
 Clawson, M., 260.
 Clay, A. L., 247.
 Claydon, T. J., 144.
 Clayton, E. E., 39.
 Clements, L. B., 480.
 Clifton, C. E., 762.
 Clyde, A. W., 575.
 Clyde, G. D., 570.
 Coarsey, R. W., 103.
 Coatney, G. R., 387.
 Cochran, H. L., 742, 888.
 Cochrane, W. W., 581.
 Cockerill, P. W., 869.
 Code, W. E., 400, 861.
 Coffey, W. C., 760.
 Coghill, K. J., 696.
 Coghill, R. D., 32, 766.
 Cohen, H., 99.
 Cohen, W. J., 578.
 Coke, J., 755.
 Coker, R. R., 760.
 Cole, C. G., 394.
 Cole, C. R., 566.
 Cole, H. H., 46.
 Cole, L. J., 47, 188, 190.
 Coleman, R., 654.
 Coles, J. D. W. A., 715.
 Coles, J. V., 734.
 Colker, D. A., 770.
 Collatz, F. A., 266.
 Collins, D. L., 684, 697, 701.
 Collins, E. R., 807.
 Collins, F. I., 469, 621.
 Colman, E. A., 477.
 Colvill, L. L., 254.
 Colvin, D., 282.
 Colwell, R. N., 637.
 Colwell, W. E., 787.
 Comandon, J., 180.
 Comin, D., 815, 862.
 Common, R. H., 396.
 Compton, L. E., 224, 500.
 Compton, O. C., 816.
 Comstock, R. E., 160.
 Conant, V., 86.
 Conde Jahn, E., 688.
 Condiff, H., 626.
 Condra, G. E., 111.
 Cones, T. U., 880.
 Conklin, D. B., 323.
 Conn, H. J., 778, 779.
 Connell, R., 248.
 Connell, W. E., 233, 375, 704, 856.*
 Conner, G. H., 288.
 Conner, J. T., Jr., 446.
 Conrad, C. M., 155.
 Conrad, R. M., 157.
 Consolazio, F. C., 624.
 Cook, A. H., 314, 483.
 Cook, B. W., Jr., 25.
 Cook, G. C., 722.
 Cook, H. L., 870.
 Cook, M. T., 670.
 Cook, R. L., 47.
 Cook, W. C., 359.
 Cook, W. H., 309, 415, 756.
 Cooley, J. S., 72.
 Cooper, D. C., 41.
 Cooper, H. K., 563.
 Cooper, H. P., 29, 909.
 Cooper, M. R., 259.
 Cooper, T. P., 760, 905, 912.
 Cooper, W. C., 387, 493.
 Cooperman, J. M., 599, 600.
 Copeland, L., 552.
 Copeland, M. A., 590.
 Copley, T. L., 756.
 Corash, P., 713.
 Corder, L., 403.
 Cordner, H. B., 757.
 Cordy, D. R., 247.
 Corin, M., 818.
 Corman, J., 166.
 Cornellus, D. R., 326.
 Cornell, F. D., Jr., 865.
 Corrington, J. D., 11.
 Corrington, M. T., 275.
 Cory, E. N., 81, 355, 687.
 Cory, V. L., 181, 638.
 Coryell, M. N., 265.
 Cosby, E. L., 614, 767.
 Cottam, C., 530.
 Cottler, W., 80, 83.
 Cotton, R. H., 301.
 Cotton, R. T., 813.
 Couch, J. F., 9.
 Coulston, F., 387.
 Coulter, S. D. [i. e. T.], 853.
 Court, A., 181.
 Courtney, W. D., 218.
 Coutinho, J. O., 87.
 Cowan, E. W., 313.
 Cowan, I. M., 522, 682.
 Cowan, J. C., 21, 463, 464, 466.
 Cowart, F. F., 888.
 Cowart, R., 170.
 Cowert, W. C., 371.
 Cox, E. H. M., 637.
 Cox, G. A., 554.
 Cox, H. R., 504.
 Cox, J. A., 531.
 Cox, M. B., 754, 757.
 Cox, M. J., 451.
 Crabb, W. D., 521.
 Craft, J. H., 318.
 Crafts, A. S., 48.
 Craig, R. T., 484.
 Craig, W. T., 504.
 Crampton, E. W., 376, 377.
 Crane, J. C., 197, 811.
 Craufurd-Benson, H. J., 543.
 Cravens, W. W., 95.
 Cravioto B. R., 127.
 Crawford, C. L., 203.
 Crawford, E. A., 713.
 Creighton, J. T., 77.
 Cremer, M. C., 514.
 Crickman, C. W., 260, 579.
 Crisler, O. S., 246.
 Cristol, S. J., 8, 9, 296, 305, 466.
 Crocker, E. C., 121.
 Crocker, W., 29.
 Crockett, S. P., 654, 911.
 Croft, A. R., 784.
 Cromer, C. O., 446.
 Cronquist, A., 638.
 Crook, A., 428.
 Crosier, W., 342.
 Crosier, W. F., 824.
 Cross, C. B., 663, 756.

- Cross, F. B., 374, 754.
 Cross, J. B., 851.
 Cross, M. C. A., 132.
 Cross, W. E., 212.
 Crossley, E. L., 557.
 Croston, C. B., 764.
 Crowe, M., 716.
 Crowley, L. V., 413.
 Crowther, E. M., 444.
 Cruess, W. V., 125, 265, 266, 417, 588, 884.
 Cruickshank, D. H., 184.
 Csonka, F. A., 773.
 Culbertson, C. C., 43, 844.
 Culbertson, J. T., 351.
 Culpepper, C. W., 123, 270, 882.
 Culton, T. G., 288.
 Cunha, T. J., 93, 377, 418.
 Cunningham, C. J., 235.
 Cunningham, E., 158.
 Cunningham, I. J., 233.
 Cunningham, L. C., 403, 579.
 Cupples, H. L., 471.
 Curran, H. R., 852.
 Currence, T. M., 506.
 Curry, A. S., 440.
 Curtis, J. D., 333, 668.
 Curtis, J. T., 491, 796.
 Curtis, P. J., 637.
 Curtiss, W. M., 444.
 Cushman, A. D., 830.
 Cuthbert, F. L., 861.
 Cutkomp, L. K., 529.
 Daggy, R. H., 531, 833.
 Dahlberg, A. C., 99, 774.
 Dahms, R. G., 522.
 Dalley, D. L., 800.
 Daines, R. H., 72.
 Dalling, T., 444.
 Dalrymple, R. S., 151.
 Dalton, J. J., 868.
 Dam, H., 432, 720.
 Damasceno, R. G., 700.
 Damerson, W. H., 325.
 Damodaran, M., 491.
 Dandliker, W. B., 35.
 Daniel, H. A., 754.
 Daniel, L., 428.
 Daniel, L. J., 616, 846.
 Daniel, T. W., 91.
 Danks, A. G., 560.
 Darfier, J., 589.
 Darling, F. F., 444.
 Darlington, C. D., 648.
 Darlow, A. E., 373, 374, 757.
 Darnell, A. L., 98.
 Daubenmire, R. F., 817.
 Daugherty, F. C., 375.
 David, W. A. L., 356, 528.
 Davidson, C. L., 101.
 Davidson, J. A., 705.
 Davidson, J. B., 254.
 Davidson, O. W., 788.
 Davidson, R. H., 698.
 Davidson, R. S., 68.
 Davies, V., 265.
 Davis, B. H., 216, 819.
 Davis, C. C., 581.
 Davis, D. E., 219.
 Davis, F. L., 176.
 Davis, G. K., 377, 707.
 Davis, H. P., 237.
 Davis, J., 559.
 Davis, J. H., 760.
 Davis, J. J., 539.
 Davis, L. G., 363.
 Davis, M. B., 755.
 Davis, P. O., 757.
 Davis, R. B., Jr., 723.
 Davis, R. E., 840.
 Davis, R. O. E., 12, 30.
 Davis, R. W., 247.
 Dawson, C. R., 878.
 Dawson, E. H., 882.
 Dawson, J. E., 328.
 Dawson, R. F., 322.
 Day, D., 639.
 Day, P. L., 614, 748.
 Day, W. R., 779.
 Deam, C. C., 34.
 Dean, H. H., 144.
 Dean, J. D., 900.
 Dean, J. G., Jr., 608.
 Dean, L. L., 210.
 Dean, R. W., 77.
 Deane, D. D., 758.
 Deane, L. M., 228.
 Deane, M. P., 228.
 Dearborn, C. H., 607.
 Dearborn, E. H., 242.
 Dearden, D. V., 556.
 Dearstyne, R. S., 160, 606.
 Deasy, C. L., 292.
 deBruyn Ouboter, M. P., 74, 75, 514.
 Decher, E. P., 108.
 Decker, P., 513.
 Decker, S. W., 144.
 Deem, A. W., 856.
 de Fonbrune, P., 180.
 de Garay, A. Delgado, 535.
 Degener, O., 315.
 de la Noceda, H. Garcia, 745.
 Delaporte, B., 38, 184, 673.
 de la Torre, L. M., 281.
 Delay, P. D., 243.
 Delf, E. M., 643.
 Delgado de Garay, A., 535.
 DeLong, D. M., 221, 363, 534.
 Delphey, C. C., 347.
 de Mello, M. T., 698.
 Demlow, M. J., 469.
 Demolon, A., 34.
 Demott, A. B., 100.
 Dempsey, E. W., 497.
 Dendy, J. S., 526, 527.
 Denko, C. W., 296.
 Denlinger, M. G., 44.
 Denton, C. A., 778.
 DenUyl, D., 205.
 de Ong, E. R., 517.
 Deonier, C. C., 79, 86, 858, 369, 534, 540.
 de P. Miranda, F., 127.
 Deppermann, C. E., 28.
 De Ritter, E., 160.
 de Ropp, R. S., 318, 390.
 Derr, L. E., 754.
 Dersal, W. R. van, 26.
 de Sales, J. F., 105.
 deS. Brunner, E., 760.
 Descartes, S. L., 727.
 de Segura, C. Bazan, 671.
 Desrosiers, R., 58, 335, 336, 819.
 Detjen, L. R., 52.
 DeTurk, E. E., 175.
 Detweiler, D. K., 241.
 Detwiler, S. B., Jr., 764.
 Deuel, H. J., Jr., 129, 615.
 DeVault, S. H., 731, 733.
 DeVaux, L. A., 352.
 Devine, J., 297.
 Dexter, S. T., 728.
 Deysson, G., 183.
 Diachun, S., 214.
 Diaz Pacheco, S., 76.
 Di Bernardo, D. J., 108.
 Dickerson, G. E., 43.
 Dickey, H. C., 238.
 Dickinson, D., 591, 735, 736, 884, 911.
 Dickinson, E. M., 860.
 Dickson, A. D., 473.
 Dickson, J. G., 41.
 Dieke, S. H., 350.
 Dietrich, W. C., 459.
 Diets, C., 30.
 Diets, T. J., 162.
 Dikmans, G., 683.
 Dilks, E., 566.
 Diller, J. D., 681.
 Diller, V. M., 313.
 Dillman, A. C., 807.
 Dillon Weston, W. A. R., 337.
 Dimick, K. P., 148.
 Dimock, W. W., 388, 566.
 Dion, W. M., 64.
 Diskant, E. M., 1.
 Dittman, L. P., 692.
 Dobie, J. B., 257, 705.
 Dodds, K. S., 650.
 Dodge, B. O., 680.
 Dodge, H. R., 540.
 Doehert, C. A., 518, 816.
 Doermann, A. H., 620.
 Doisy, E. A., Jr., 600.
 Doljanski, L., 396.
 Doll, E. H., 111.
 Doll, E. R., 245, 888, 566, 858.
 Dollear, F. G., 472.
 Donald, H. P., 495, 496.
 Donelson, E. G., 590.
 Donovan, C. G., 778.
 Donovan, E. L., 760.
 Doolittle, S. P., 505, 820.

- Dore, W. H., 4.
 Dorman, C., 812.
 Dornbush, A. C., 549.
 Dorsey, L. M., 265.
 Dos Passos, C. F., 221.
 Doten, S. B., 445.
 Doucette, C. F., 364.
 Doudoroff, M., 4, 81.
 Douglas, W. A., 287, 806.
 Douglass, A. E., 779.
 Dove, W. E., 85.
 Dow, G. F., 580.
 Down, E. E., 656.
 Downer, A. W. E., 137.
 Doyle, L. P., 394.
 Doyle, T. M., 103.
 Drake, C. J., 670.
 Drake, N. L., 8.
 Drake, T. G. H., 428.
 Drechsler, C., 75, 315, 819.
 Dreker, L., 134.
 Drenckhahn, V. V., 418.
 Driggers, B. F., 695.
 Driver, C. M., 503.
 Drobkov, A. A., 638.
 Droulneau, G., 73.
 Drummond, W. M., 755.
 Dubnoff, J. W., 419.
 Dubois, C. W., 881.
 Dubord, C., 124.
 Dubos, R. J., 761.
 DuBrow, F., 620.
 Du Buy, H. G., 519, 646.
 Duck, J. T., 108.
 Duckworth, J., 91.
 du Frane, B., 606.
 Duggar, B. M., 645, 794.
 Duley, F. L., 27.
 DuMars, M. L., 121.
 Dumbleton, L. J., 228.
 Dumm, M. E., 230.
 Dunbar, R. E., 146.
 Duncan, C. W., 382.
 Duncan, R. E., 796.
 Duncelman, P. H., 515.
 Dunez, A., 34.
 Dungan, G. H., 198, 199, 502, 806.
 Dunham, H. W., 480.
 Dunham, W. E., 370.
 Dunker, C. F., 395, 414.
 Dunkerley, M. L., 895.
 Dunkley, W. L., 714.
 Dunlap, A. A., 659.
 Dunn, L. C., 762.
 Dunn, M. S., 14, 15, 618, 619.
 Dunning, J. W., 164, 165.
 Durchon, M., 225, 859.
 Durfee, A. E., 446.
 Durrell, W. B., 721.
 Dustan, G. G., 228.
 Dustman, E. B., 5.
 Dutcher, E. A., 742.
 Dutton, H. J., 155, 161, 775.
 Duvel, J. W. T., 201.
 Dyar, M. T., 177.
 Dye, M., 133.
 Dzialoszynski, L. M., 132.
 Eager, G. W., 86.
 Eaker, C. M., 8.
 Earle, F. R., 472.
 Eaton, F. M., 65.
 Eaton, H. D., 382.
 Eaton, O. N., 44.
 Eaton, R. C., 144.
 Ebeling, W., 79.
 Ebert, W. J., 92.
 Eckhardt, R. C., 287, 806.
 Eddins, A. H., 68, 819.
 Edens, W. J., 756, 870.
 Edgecomb, S. W., 370.
 Edgerton, C. W., 515.
 Edgerton, L. J., 816.
 Edgington, G., 29, 738.
 Edison, A. O., 745.
 Edman, M., 29.
 Edwards, A. D., 865.
 Edwards, B. G., 775.
 Edwards, F. E., 177.
 Edwards, P. R., 243, 389, 716, 853.
 Edwards, R. L., 683.
 Edwards, S. J., 390.
 Efferson, J. N., 113.
 Efron, A., 164, 767.
 Eggers, V., 322.
 Eggert, R., 486.
 Eggert, R. J., 581.
 Eheart, J. F., 888.
 Eheart, M. S., 276.
 Eichler, G. J., Jr., 525.
 Eide, P. M., 87, 358, 363, 368, 540.
 Einsner, A., 5.
 Eke, P. A., 581.
 Eklund, A. B., 431.
 Eklund, C. M., 389.
 Ekstrom, G. F., 583.
 Elder, C., 246, 394.
 Elder, W. C., 754.
 Elder, W. H., 523.
 Eldred, N. R., 449.
 Eldredge, D., Jr., 38.
 Eldredge, J. C., 905.
 El Itriby, A. A., 495.
 Ellenby, C., 514.
 Ellinger, P., 12, 280.
 Elliott, C., 824.
 Elliott, R. F., 848.
 Ellis, G. H., 6, 151.
 Ellis, N. K., 198.
 Ellis, N. R., 840.
 Ellis, W. J., 430.
 Ellison, L., 349.
 Elmore, J. W., 14.
 Elrod, J. C., 261.
 Elting, E. C., 447.
 Elvehjem, C. A., 19, 130, 135, 179, 284, 272, 283, 395, 420, 421, 423, 454, 549, 599, 600, 610, 616, 747, 759, 761, 846.
 Elwell, H. M., 754.
 Ely, F., 850.
 Emerson, A. W., 570.
 Emerson, G. A., 134, 429, 430.
 Emerson, R. L., 166.
 Emery, W. T., 822.
 Emik, L. O., 521.
 Enilen, J. T., Jr., 76, 350.
 Emmett, A. D., 234, 624.
 Ender, F., 563.
 Enders, R. K., 248.
 Enfield, G. H., 808.
 Engebretson, T. O., 870.
 Engelhardt, V. A., 762.
 Engelking, R., 756, 867.
 Engene, S. A., 584.
 Engley, F. B., Jr., 387.
 English, H., 53.
 English, L. L., 684.
 Englund, E., 606.
 Enslinger, D., 873.
 Ensminger, M. E., 91, 93, 377.
 Eny, D. M., 54, 506.
 Enzmann, J., 355.
 Epp, A. W., 111.
 Erdman, H. E., 724.
 Erdman, L. W., 180.
 Erikson, A. B., 730.
 Ergle, D. R., 466.
 Erickson, A. B., 522.
 Erickson, L. C., 47.
 Eriksen, S., 107.
 Esau, K., 324.
 Esbo, H., 66.
 Eschmeyer, R. W., 526, 527.
 Espe, D., 383.
 Esplin, A. L., 233, 375, 856.
 Esselen, K. O., 413.
 Esselen, W. B., Jr., 124, 269, 270, 271.
 Etheridge, W. C., 193.
 Evans, B. R., 705.
 Evans, C. D., 764.
 Evans, F. R., 852.
 Evans, G. G., 705.
 Evans, H. M., 611.
 Evans, R., 473.
 Evans, R. J., 20, 156, 550, 610, 773, 847.
 Eveleth, D. F., 756.
 Ewan, M. A., 465, 775.
 Ewart, W. H., 225.
 Ewing, F. M., 250.
 Ewing, K. P., 535.
 Ezell, B. D., 123, 270.
 Fabian, F. W., 267, 884.
 Fairbanks, B. W., 43, 845.
 Fairchild, D., 62, 667.
 Fairchild, G. B., 88.
 Fairchild, S. J., 518.
 Falconer, J. I., 110, 410, 872.
 Fales, J. H., 77, 684, 840.
 Falk, I. S., 578.
 Falkenburg, L. B., 21, 463, 466.

- Falkner, G. B. S., 188.
 Fallis, A. M., 387.
 Fang, S. C., 777.
 Fankuchen, I., 762.
 Fardig, O. B., 623.
 Farkas, R., 42.
 Farmer, F. A., 846.
 Farnier, D. S., 522.
 Farnham, C. H., 632.
 Farnworth, C. H., 403.
 Farr, M. M., 397, 398.
 Farrall, A. W., 99.
 Farrankop, H., 122, 131, 278.
 Farrar, J. L., 667.
 Farrar, W. W., 77.
 Farrell, F. D., 875.
 Farrington, C. C., 581.
 Farstad, C. W., 688.
 Farnworth, C. H., 403.
 Fawcett, G. L., 347.
 Fawcett, H. S., 346, 828.
 Feaster, C. V., 339.
 Fedde, M., 111.
 Federer, W. T., 199.
 Fee, H. A., 288.
 Feenstra, E. S., 103, 717.
 Feinstein, A. L., 623.
 Feldkamp, C. L., 591.
 Feldman-Muhsam, B., 686.
 Felix, E. L., 58, 335, 336, 819.
 Fell, H. B., 101.
 Fellers, C. R., 124.
 Felt, C. E., 266.
 Fenne, S. B., 58, 335, 819.
 Fennell, D. I., 791.
 Fenske, L. J., 113, 116.
 Fenstermacher, R., 245.
 Fenton, F., 132, 410, 589, 880, 889, 890.
 Fenton, F. A., 757.
 Ferguson, S. W., 678.
 Ferrin, E. F., 93.
 Fertig, J. W., 713.
 Feuge, R. O., 453, 455.
 Feustel, I. C., 148.
 Fevold, H. L., 591, 609.
 Fickel, E. B., 407, 583.
 Fieger, E. A., 159, 429, 881, 891.
 Field, J. B., 720.
 Filachione, E. M., 146.
 Filinger, G. A., 816.
 Filipi, T. A., 111.
 Filley, H. C., 111.
 Filmer, R. S., 67, 833.
 Finch, A. H., 665.
 Fincher, M. G., 560, 854.
 Findlay, J. D., 557.
 Findlay, W. M., 47.
 Findley, T. W., 294, 463.
 Finney, G. L., 535, 835.
 Finney, K. F., 306, 622.
 Fireman, M., 785.
 Fleischbach, H., 7, 8.
 Fish, V. B., 5.
 Fisher, C. D., 126, 270.
 Fisher, C. H., 146.
 Fisher, C. K., 77.
 Fisher, E. H., 675, 840.
 Fisher, G., 568.
 Fisher, G. S., 160, 459.
 Fisher, H., 823.
 Fisher, K. J., 80.
 Fisher, W. S., 221.
 Fishwick, V. C., 375.
 Flitch, J. B., 382.
 Fitts, J. W., 481.
 Fitzsimmons, C., 285.
 Flanders, S. E., 77.
 Fleck, E. E., 9, 77, 223, 467.
 Fleming, C. E., 446.
 Fleisch, L. E., 731.
 Fletcher, D. A., 415.
 Fletcher, H. M., 284, 433.
 Flickinger, M. H., 321.
 Flinn, R. H., 140.
 Flint, L. H., 38.
 Flor, H. H., 210.
 Flora, S. D., 168.
 Flynn, F. F., 8.
 Flynn, L. M., 424, 884.
 Flynn, P. F., 298.
 Fobes, C. B., 474.
 Foeste, A., 277.
 Fohrman, M. H., 652.
 Folkers, K., 761.
 Follis, R. H., Jr., 104, 375.
 Folsom, D., 825.
 Fonbrune, P. de, 180.
 Fous, W. L., 56.
 Fontaine, T. D., 763, 764.
 Foot, A. S., 233.
 Forbes, E. B., 446, 843.
 Forbes, W. T. M., 80, 353.
 Ford, E. C., 117, 863.
 Ford, O. W., 151.
 Forgacs, J., 269.
 Forrest, L. A., 756.
 Forsell, M. J., 516.
 Forster, G. W., 606.
 Forsythe, G. B., 308.
 Foster, H. H., 58.
 Foster, J. E., 547.
 Foster, J. W., 314, 636.
 Foster, L., 294.
 Foster, R. E., 515.
 Foster, R. G., 873.
 Fowle, C. D., 683.
 Fox, S. W., 313.
 Fraenkel, G., 685.
 Frane, B. du, 606.
 Frank, A. H., 189, 243.
 Frank, B., 833.
 Frankenburg, W. G., 762.
 Frankenfeld, J. C., 813.
 Frankl, W., 14, 15.
 Franklin, H. J., 836.
 Frankston, J. E., 20, 128, 593, 736.
 Frantz, R. S., 7, 145.
 Fraps, G. S., 275, 278, 597, 706, 743, 892.
 Fraps, R. M., 189, 190, 801.
 Fraser, F. C., 86.
 Frazier, N. W., 77, 828.
 Frazier, W. C., 814.
 Frear, D. E. H., 531.
 Free, G. R., 178, 811.
 Freeman, A. F., 302, 462.
 Freeman, H. A., 353.
 Freeman, J. F., 389.
 Freeman, S., 596.
 Freeman, T. R., 610, 765.
 Freides, R., 618.
 Freitag, J. H., 828.
 French, C. E., 589.
 French, C. S., 453, 640.
 French, D. R., 126.
 French, M. H., 90.
 French, R. B., 886.
 Frechman, R., 598.
 Frey, C. N., 762.
 Frey, P. R., 235.
 Friar, H. F., 588.
 Frick, E. J., 720.
 Fricker, J., 640.
 Fried, M., 787.
 Frieden, E. H., 100.
 Friedkin, M., 302.
 Friend, R. B., 352.
 Fries, L., 487.
 Friley, C. E., 606.
 Frischknecht, C. O., 709.
 Froeschner, R. C., 221.
 Froker, R. K., 579, 581.
 Frolk, E., 111.
 Frudden, C. E., 255.
 Fruton, J. S., 761.
 Fry, H. S., 756.
 Fudge, B. R., 272.
 Fuller, J. E., 634.
 Fuller, J. L., 351.
 Fuller, W. H., 809.
 Fulmer, E. I., 767.
 Fulton, B. B., 536, 836.
 Fulton, Z. M. K., Jr., 728.
 Fultz, D., 22.
 Funchess, M. J., 143.
 Furness, T. L., 252.
 Furr, J. R., 203, 493.
 Furry, M. S., 604.
 Gabriel, M. L., 653.
 Gaddy, V. L., 480, 811.
 Gadeken, A., 758.
 Gaetjens, C. F., 558.
 Gaffron, H., 761.
 Galley, F. B., 636, 792.
 Gaines, J. G., 335, 819.
 Gaines, P. G., 5.
 Gaines, W. L., 711.
 Galbraith, H., 738.
 Gale, E. F., 762.
 Gallup, W. D., 231, 373.
 Gambrell, F. L., 860, 696.
 Gamow, L. R., 357.
 Garay, A. Delgado de, 535.
 Garber, H. J., 862.
 Garcia, M. R., 101.

- Garcia de la Noceda, H., 745.
 Garcia-Piquera, I. C., 667.
 Gardner, J., 744.
 Gardner, R., 169, 177.
 Gardner, V. R., 752.
 Garlick, N. L., 387.
 Garlock, F. C., 252.
 Garman, P., 352, 531.
 Garner, J. M., 674.
 Garnham, P. C. C., 367.
 Garren, K. H., 819.
 Garrison, C. S., 805.
 Gaschen, H., 700.
 Gastinel, V., Jr., 457.
 Gastrock, E. A., 147, 769.
 Gatewood, J. S., 475.
 Gauger, H. C., 252, 568, 569.
 Gauser, G. H., 8.
 Geddes, W. F., 64, 762, 825.
 Gelb, D. S., 713.
 Gelling, E. M. K., 241.
 Gelser, S. W., 587.
 Geller, H. H., 165.
 Gentry, R. F., 246.
 Gerhardt, F., 53.
 Gerlaugh, P., 841.
 Gersdorff, W. A., 222, 229, 832.
 Gershoy, A., 658.
 Gerson, N. C., 167.
 Gertler, S. I., 77, 81.
 Geyer, R. P., 272, 454.
 Ghosh, A. R., 698.
 Gibbens, R. T., 515.
 Gibbons, N. E., 252.
 Gibbons, R., 111.
 Gibbons, W. J., 560.
 Gibson, G. W., 680.
 Gibson, T., 553.
 Gieger, M., 371, 888, 911.
 Gift, H. H., 775.
 Gilberg, H., 277.
 Gilchrist, B. M., 227.
 Gilcreas, F. W., 713.
 Giles, G. W., 577.
 Gill, D. A., 355.
 Gillam, W. S., 18.
 Gilligan, G. M., 266, 883, 895.
 Gillogly, L. G., 365.
 Gilman, J. C., 315, 337.
 Gilmore, P. A., 750.
 Ginsburg, J. M., 366, 778.
 Giral, F., 281.
 Gittler, J. B., 587.
 Gjullin, C. M., 86.
 Glading, B., 76.
 Glasgow, H., 693.
 Glasgow, R. D., 684, 697, 701.
 Glasscock, R. S., 283.
 Glazener, E. W., 498, 499, 707.
 Gleason, P. C., 301.
 Gleim, E., 890.
 Glennie, A. E., 588.
 Glick, D., 273.
 Glover, R. E., 683.
 Gloyer, W. O., 144.
 Glynne, M. D., 64, 671.
 Goble, F. C., 369.
 Goble, G. J., 702.
 Godbey, C. B., 325.
 Goddard, V. R., 431.
 Godden, W., 444.
 Godfrey, A. B., 44.
 Godfrey, P. R., 19.
 Goettsch, M., 105.
 Goldblatt, L. A., 296.
 Goldschmidt, V. M., 29.
 Goldsmit, L., 721.
 Goldsmith, G. A., 127.
 Goldstein, H., 435.
 Goldthwaite, N. E., 911.
 Goldwater, W. H., 2.
 Good, B., 378.
 Gooden, E. L., 8.
 Goodhue, L. D., 77, 78, 684, 692, 778, 840.
 Goodman, G. J., 502.
 Goodsell, W. D., 582, 583.
 Goodstein, S., 725.
 Goolden, E. B., 419.
 Gordon, R. E., 635.
 Gordon, R. F., 721.
 Gordon, S. A., 35, 485.
 Gortner, R. A., Jr., 739.
 Gortner, W. A., 878, 880.
 Goss, H., 393.
 Goss, W. H., 459.
 Goth, A., 719.
 Gottlieb, D., 335, 674, 821.
 Gottlieb, S., 778.
 Gouck, H. K., 839.
 Goudey, R. F., 201.
 Gould, C. J., 215.
 Gould, H. G., 111.
 Gould, H. P., 759.
 Gould, I. A., 7, 145.
 Gouny, P., 73.
 Gourlay, E. S., 226.
 Gourley, J. H., 758.
 Gowanloch, J. N., 8.
 Gowen, J. W., 497.
 Grace, N. H., 667.
 Graessle, O. E., 388.
 Graff, M. M., 161.
 Graham, B. E., 248.
 Graham, C. E., 618.
 Graham, E. H., 26.
 Graham, J. J. T., 222.
 Graham, V. E., 714.
 Graham, W. D., 552.
 Gram, E., 676.
 Granados, H., 432.
 Grandfield, C. O., 805.
 Granett, P., 79.
 Granger, W., 188.
 Granhall, I., 650.
 Grant, G. A., 416.
 Grant, T. J., 204.
 Granville, W. C., 816.
 Grassl, C. O., 328.
 Grau, C. R., 105, 285.
 Graves, D. N., 397.
 Gray, H., 399.
 Gray, H. F., 86.
 Gray, K. W., 83.
 Gray, W. E., 414.
 Grayson, J. M., 689.
 Greaney, F. J., 62, 214, 335.
 Greaves, E. O., 633.
 Greaves, J. E., 173, 608, 633, 785.
 Greaves, R. E., 252, 569.
 Greaves, T., 357.
 Green, A., 662.
 Green, D. E., 634, 761.
 Green, F. M., 331.
 Green, J. M., 798.
 Green, R. A., 222.
 Green, R. G., 395.
 Green, R. M., 760.
 Green, W. W., 188, 325, 800.
 Greenbank, G. R., 384.
 Greenberg, L. D., 471.
 Greenblatt, A. P., 243.
 Greenblatt, I. J., 243.
 Greene, J. M., 571.
 Greene, R. E. L., 756.
 Greenhut, I. T., 179.
 Greenleaf, V. G., 895.
 Greenwood, A. W., 326.
 Greenwood, D. E., 352, 691.
 Greenwood, F. L., 298.
 Greer, S. R., 332.
 Gregory, L. E., 35, 206.
 Gregory, P. H., 680.
 Gregory, P. W., 187, 799.
 Greig, A. S., 562.
 Grelet, N., 483.
 Griffith, M., 374.
 Griffith, R. B., 154, 298.
 Griffiths, A. E., 665.
 Griffiths, H. J., 562.
 Grigsby, B. H., 49, 328, 664.
 Grim, R. E., 861.
 Grimes, W. E., 579.
 Grison, P., 225.
 Groody, M., 387.
 Gross, C. E., 268.
 Gross, D. L., 111.
 Gross, W. G., 388.
 Groth, A. H., 445.
 Grotlich, V. E., 150, 303.
 Grove, J. F., 637.
 Grove, L. C., 507.
 Groves, A. B., 510, 629, 819.
 Groves, J. W., 670.
 Gruelle, K. B., 127.
 Guerrant, N. B., 124, 623, 742.
 Guest, P. L., 507, 911.
 Gul, H. L., 820.
 Gullickson, T. W., 382, 712.
 Gunkel, J. E., 493.
 Gundlach, M. C., 912.
 Gunn, C. K., 520, 755.
 Gunn, R. M. C., 188.
 Gussalus, I. C., 179, 634, 768, 769.

- Gunselman, M. A., 139.
 Gunther, E., 316.
 Gunther, F. A., 305.
 Gunton, H. C., 169, 780.
 Gupta, J. C. Sen, 493.
 Gustafson, A. F., 24, 311.
 Gustafsson, Å., 650.
 Gustin, W., 308.
 Guthrie, E. S., 554, 555.
 Guthrie, J. D., 3, 153, 295, 459, 773.
 Gutsche, A. E., 59.
 Guyomard, L., 73.
 Guyot, L., 63, 512.
 Gyorgy, P., 743.
 Gyrisko, G. G., 684, 690.
 Haagen-Smit, A. J., 35, 292, 742.
 Haas, A. R. C., 29, 332, 828.
 Haas, V., 879.
 Haas, V. H., 250.
 Haasls, F. W., 21.
 Habermann, R. T., 717, 856.
 Hackett, P. L., 776.
 Hads, H. L., 290.
 Haenseler, C. M., 215, 216, 819.
 Hafenrichter, A. L., 654.
 Hagborg, W. A. F., 213.
 Hagedoorn, A. L., 652.
 Hager, H. E., 434.
 Hahn, P. F., 130.
 Haigh, L. D., 313.
 Haines, G., 447.
 Haines, R. E., 108.
 Hainsworth, R. G., 262.
 Haise, H. R., 785, 808.
 Haist, A. H., 111.
 Hajny, G. J., 162.
 Halbrook, N. J., 461.
 Hale, F., 179.
 Hale, J. B., 509, 673.
 Hale, M. W., 562, 563.
 Hall, G. O., 379.
 Hall, H. S., 434.
 Hall, J. A., 554.
 Hall, S. A., 4.
 Hall, T. F., 541.
 Hall, V. L., 713.
 Hall, W. J., 860.
 Haller, F. W., 446.
 Haller, H. L., 4, 8, 9, 149, 155, 156, 223, 296, 298, 305, 466, 467.
 Hallman, L. F., 129.
 Hallock, H. C., 833.
 Halloran, A. F., 682.
 Halma, F. F., 846, 847.
 Halpin, J. G., 95.
 Halvorson, H. O., 465.
 Ham, W. E., 193, 378, 547.
 Hamburger, W. J., 433, 434.
 Hamil, B. M., 265.
 Hamilton, T. S., 276, 292, 422, 480, 600, 740, 741.
 Hammaker, E. M., 454, 456.
 Hammer, A. L., 287.
 Hammer, B. W., 240.
 Hammon, W. M., 367.
 Hamner, A. L., 806.
 Hamner, C. L., 50, 320.
 Hamner, K. C., 29, 603.
 Hanawalt, W. B., 477.
 Hancock, N. I., 660.
 Handford, R. H., 352.
 Handley, C. O., 524.
 Hanig, M., 467.
 Hankins, O. G., 121, 271, 395, 414.
 Hankinson, K., 25.
 Hannah, J. A., 760.
 Hannay, A. M., 407, 868.
 Hannesson, H. A., 48.
 Hansberry, R., 9.
 Hansen, C. M., 722.
 Hansen, D., 375.
 Hansen, H. C., 715.
 Hansen, H. N., 347, 516.
 Hansen, J. W., 156.
 Hansen, N. E., 648, 807.
 Hansen, P. L., 392, 405.
 Hansing, E. D., 511.
 Hanson, H. B., 663.
 Hanson, H. C., 75.
 Hanson, H. J., 32.
 Hanson, J. F., 353.
 Hanson, L. E., 92.
 Hanzlik, S., 628.
 Harden, F. G., 447.
 Harden, P. H., 86.
 Hardenbrook, H. J., 391.
 Hardesty, J. O., 30.
 Hardin, C. M., 115.
 Hardin, L. S., 579.
 Harding, P. L., 283.
 Harding, T. S., 863.
 Harding, W. A., 272.
 Hardman, N. H., 228.
 Hardt, C. R., 765.
 Hardy, E. A., 766.
 Hardy, F., 274.
 Hare, M., 522.
 Haring, R. C., 528.
 Harlan, J. R., 658.
 Harman, S. W., 362, 694.
 Harmer, P. M., 29, 53.
 Harmon, M. E., 265.
 Harmston, F. C., 353.
 Harper, C., 91.
 Harper, H. B., 144.
 Harper, H. J., 204, 754.
 Harper, J. O., 367.
 Harper, R. E., 55, 505.
 Harrar, J. G., 511.
 Harris, A. J., 260, 728.
 Harris, E., 373.
 Harris, E. E., 153, 162.
 Harris, F. L., 410.
 Harris, H. C., 389.
 Harris, J. O., 179.
 Harris, L. E., 521, 558.
 Harris, M. E., 265.
 Harris, P. L., 789, 762.
 Harris, R. H., 48, 199.
 Harris, R. S., 127.
 Harris, R. V., 678.
 Harris, V., 267.
 Harrison, A. L., 58.
 Harrison, C. M., 88, 703.
 Harrison, Z. D., 86.
 Harry, J. B., 510.
 Hart, E. B., 272, 395, 454, 549, 616, 846.
 Hart, G. H., 910.
 Hart, L., 708.
 Hart, P. D., 313.
 Hartellus, V., 633, 634.
 Hartley, M. C., 573.
 Hartridge, V. B., 389.
 Hartzell, A., 540.
 Hartzog, M. B., 293, 294.
 Harvey, E. H., 424.
 Harvey, E. M., 54.
 Harwood, P. D., 101, 388.
 Haseman, L., 225, 532, 544, 833, 840.
 Haskell, H. S., 191.
 Haslam, T. P., 144.
 Haslbauer, O. F., 526, 527.
 Hasler, A. D., 525.
 Hassid, W. Z., 4.
 Hatch, M. H., 684.
 Hatchett, S. P., 368.
 Hathaway, H. L., 759.
 Hathaway, M. L., 129, 595.
 Hauber, U. A., 534.
 Haubrich, L. R., 387.
 Haubrich, W. R., 387.
 Hauck, C. W., 816, 872, 877.
 Hauck, H. M., 775.
 Hauge, S. M., 231, 768, 775.
 Haurwitz, B., 473.
 Hausman, L. A., 683.
 Havas, L. J., 639.
 Hawk, V. B., 843.
 Hawker, L. E., 644.
 Hawkes, J. G., 339, 503.
 Hawking, F., 249.
 Hawkins, A., 198.
 Hawkins, J. H., 689.
 Hawkins, L. E., 865.
 Hawkins, P. A., 251, 888.
 Hay, R. L., 416.
 Hayden, C. C., 799.
 Hayden, C. E., 560.
 Hayden, F. R., 888.
 Hayes, H. K., 194, 494.
 Hayes, R. A., 8, 305.
 Hayes, W., 242, 389.
 Hayhurst, H., 85.
 Hayne, D. W., 525.
 Haynes, H. L., 79.
 Haynes, S. K., 547, 552.
 Hays, F. A., 380.
 Hayward, F. W., 307, 418, 444.
 Hazel, L. N., 42, 825, 801.

- Headley, F. B., 578, 845.
 Heath, G. B. S., 701.
 Heath, J., 687.
 Heatley, N. G., 483.
 Hedeman, L. P., 248.
 Hedges, F., 823, 827.
 Hedges, H., 579.
 Hedges, T. R., 262.
 Hedlund, G. W., 446.
 Heflin, C. P., 409.
 Hegsted, D. M., 419, 420.
 Hehre, E. J., 765.
 Helberg, B. C., 344.
 Heidelberg, M., 762.
 Heinemann, W. W., 91, 93.
 Heinrich, C., 224.
 Heintze, S. G., 509.
 Heinze, P. H., 888.
 Heinzelman, D. C., 302.
 Helser, C. B., Jr., 812.
 Helshman, J. O., 247.
 Heltzmann, P., 483.
 Helbach, R., 163.
 Heller, V. G., 373, 374, 388.
 Heller, W., 763.
 Helm, C. A., 193.
 Helson, G. A. H., 357, 529.
 Hemming, H. G., 637.
 Hemphill, P. V., 287, 444, 756.
 Hendershot, J. M., 239.
 Henderson, C., 624.
 Henderson, E. W., 380.
 Henderson, H. O., 192.
 Henderson, J. A., 800.
 Henderson, J. L., 384, 457, 555.
 Henderson, L. S., 833.
 Henderson, R. G., 677, 819.
 Hendricks, S. B., 145, 777.
 Hendrickson, A. H., 52.
 Hendrix, A. T., 255.
 Hendrix, W. E., 261.
 Hening, J. C., 851.
 Henley, R. R., 394, 860.
 Henney, H. J., 436.
 Henning, G. F., 871.
 Henning, M. W., 719.
 Henry, A. W., 339.
 Henry, C. G., 272.
 Henry, K. M., 556.
 Henry, N. S., 744.
 Henson, P. R., 287, 503.
 Herb, S. F., 454, 456, 471.
 Herbert, L. P., 811.
 Herbst, E. J., 423.
 Herman, H. A., 98.
 Hermann, F. J., 792.
 Herma, W. B., 911.
 Herren, H., 280.
 Herrick, C. A., 387.
 Herrington, B. L., 265, 617.
 Herrmann, G. R., 378.
 Hershberger, L. R., 387.
 Hertel, K. L., 806.
 Hervey, A., 318.
 Hervey, A. H., 639.
 Hervey, G. E. R., 684.
 Herzer, F. H., 756, 911.
 Hess, A. D., 541.
 Hess, K. P., 750.
 Hess, W. C., 301.
 Hessler, L. E., 466.
 Hester, J. B., 25.
 Hestrin, S., 647.
 Hetrick, L. A., 684.
 Hetzel, R. D., 912.
 Heuberger, J. W., 81, 336, 356, 684.
 Heuser, G. F., 93, 94, 95, 421, 551, 616, 707, 846.
 Hewitt, E. J., 58.
 Hewson, E. W., 780.
 Hey, G. L., 225.
 Heyne, E. G., 511.
 Heys, F. M., 101.
 Heywang, B. W., 551.
 Hibbard, A. D., 201.
 Hickey, M. B., 75.
 Hickey, R. J., 31.
 Hickin, N. E., 78.
 Hickman, C. W., 92, 377.
 Hickman, K., 739.
 Hickman, K. C. D., 762.
 Hicock, H. W., 572, 669.
 Hilde, J. C., 144.
 Hiler, S. W., 618.
 Higginbottom, C., 557.
 Highton, R. B., 367.
 Higuchi, K., 241.
 Hilbert, G. E., 15, 450, 451.
 Hildebrand, F. C., 266, 762.
 Hildebrandt, A. C., 793.
 Hill, C. M., 228.
 Hill, F. F., 578.
 Hill, J. A., 605.
 Hill, R. B., 228.
 Hill, R. E., 82, 689.
 Hillier, J. C., 373, 374, 756.
 Hills, C. H., 302.
 Hills, O. A., 834.
 Hillson, H. D., 12.
 Hillstead, A. F. C., 221.
 Hilmoe, R. J., 789.
 Hilton, J. H., 370.
 Himes, H. W., 625.
 Hindmarsh, W. L., 42.
 Hiner, R. L., 271.
 Hinman, F. G., 83.
 Hinshaw, E. B., 384.
 Hinshaw, W. R., 398, 568, 569.
 Hinton, H. E., 85, 685.
 Hipp, N. J., 163.
 Hirsch, A., 389.
 Hiscox, E. R., 557.
 Hites, B. D., 297.
 Hixson, E., 758.
 Hoag, E. H., 160.
 Hochberg, M., 159, 425, 426, 471, 625.
 Hodes, H. L., 247.
 Hodge, H. C., 300.
 Hodge, W. H., 148.
 Hodgson, C. W., 705.
 Hodgson, R. E., 370, 558, 800.
 Hodnett, E., 445.
 Hodson, A. C., 225, 226.
 Hodson, A. Z., 20, 470.
 Hoecker, R. W., 263.
 Hoecker, W. H., 240.
 Hofer, J. A., 373, 374.
 Hofer, A., 64, 470.
 Hoffman, H. A., 399.
 Hoffmann, E., 93.
 Hoffpauir, C. L., 3, 617.
 Hofmann, K., 625, 744.
 Hogan, A. G., 234, 424, 552, 884.
 Hohl, L., 881.
 Hohl, L. A., 126.
 Hok, K. A., 483.
 Holbeche, J. A., 516, 678.
 Holdaway, F. G., 684, 837.
 Holden, M., 12, 180.
 Holdsworth, R. P., Jr., 86.
 Holland, A. H., 675.
 Holland, R. F., 832.
 Hollander, M., 300.
 Holley, W. D., 40.
 Hollinger, M. E., 282, 898, 899.
 Hollingshead, R. S., 414.
 Holm, G. E., 384, 386, 418.
 Holman, W. I. M., 428.
 Holmboe, J., 308.
 Holmes, A. D., 131, 240, 277, 413.
 Holmes, J. O., 127, 274.
 Holmgren, A. H., 664.
 Holst, E. C., 370.
 Holt, A. F., 800.
 Holt, A. S., 646, 912.
 Holt, M. E., 28.
 Holtman, D. F., 568.
 Holubinsky, I. N., 37.
 Honold, E., 21.
 Hood, S. L., 150.
 Hoogstraal, H., 227, 698.
 Hooker, W. J., 343, 821.
 Hooks, I. J., 399.
 Hoover, S. R., 162.
 Hopkins, J. A., 606, 724.
 Hopkins, R. H., 762.
 Hopp, H., 814.
 Hopper, T. H., 459.
 Hopper, W. C., 756.
 Hopperstead, S. L., 72, 678.
 Horowitz, N. H., 422.
 Horsfall, J. G., 61.
 Horton, D. C., 406.
 Hoskins, E. R., 264.
 Hoss, R. M., 144.
 Hotelling, N., 410.
 Hotchkiss, R. D., 761.

- Hough, W. S., 356, 684, 694.
 Houlahan, M. B., 35, 422.
 Houseman, E. E., 199.
 Houssay, B. A., 761.
 Houston, J., 556.
 Hovanitz, W., 87.
 Hove, E. L., 6, 18, 19, 730.
 Hove, Z., 6, 18, 19.
 Hoveland, N., 441.
 Howard, C. S., 399.
 Howard, L. B., 879.
 Howell, C. E., 410.
 Howell, H. H., 526.
 Howell, L. D., 115.
 Howes, C. E., 288.
 Howlett, F. S., 319.
 Hoxsie, C. H., 288.
 Hoyman, W. G., 211.
 Hoyt, H. H., 715.
 Hubbard, E. D., 394.
 Hubbard, J. E., 611.
 Hubbard, V. C., 663, 754.
 Hucker, G. J., 268, 319.
 Hockett, H. C., 691.
 Huddleson, I. F., 765.
 Hudson, J. F., 584.
 Hudson, R. S., 378.
 Huff, C. G., 387.
 Huff, J. W., 148, 745.
 Huffman, C. F., 382.
 Hughes, C. O., 387.
 Hughes, C. W., 231.
 Hughes, E. B., 280.
 Hughes, E. H., 46, 410.
 Hughes, H. D., 903.
 Hughes, J. S., 382, 892.
 Hukill, W. V., 577.
 Hulbert, H. H., 729.
 Hulen, S., 424.
 Hull, F. E., 245, 858.
 Hull, R., 292, 673.
 Humphreys, S., 375.
 Humphreys, W. J., 630.
 Hunckel, W. J., 770.
 Hungate, R. E., 31.
 Hungerford, C. W., 210.
 Hunt, G. M., 838.
 Hunter, A. S., 170, 807, 808.
 Hunter, G., 602.
 Hunter, G. J. E., 557.
 Hunter, H. A., 891.
 Hunter, R. F., 297.
 Hunsiker, O. F., 558.
 Hurd, L. M., 870.
 Hurd-Karrer, A. M., 478.
 Hurlburt, V. L., 728.
 Hurlbut, H. S., 77.
 Hurwitz, C., 150.
 Hurwitz, M. L., 605.
 Husman, C. N., 79.
 Huston, H. H., 410.
 Hustrulid, A., 402.
 Hutcheson, J. R., 760.
 Hutcheson, T. B., 200.
 Hutchings, L. M., 394, 717.
 Hutchins, M. C., 123, 270, 882.
 Hutchinson, G. E., 29.
 Hutchison, C. B., 910.
 Hutner, S. H., 313.
 Hutson, R., 675.
 Hutt, F. B., 187, 497, 853.
 Hyland, H. L., 660.
 Hyson, C. D., 581.
 Ibach, D. B., 581.
 Ikeda, C., 613.
 Imhoff, K., 109.
 Immer, F. R., 606.
 Ingle, L., 79.
 Ingram, R. L., 87.
 Insko, W. M., Jr., 858.
 Irby, V., 128, 593, 736.
 Irving, G. W., Jr., 763, 764.
 Irwin, D. L., 190.
 Irwin, M. R., 188, 190.
 Isaac, I., 673.
 Isbell, H., 616.
 Isely, D., 533, 834.
 Isely, F. B., 353.
 Israelsen, O. W., 570, 583.
 Ivanoff, S. S., 81.
 Ives, M., 283.
 Ives, R. L., 166, 167, 309, 474, 628.
 Ivy, E. E., 535.
 Jaap, R. G., 45, 46, 234, 326, 759.
 Jack, E. L., 384, 457, 555.
 Jacks, H., 61, 80.
 Jackson, A. W., 339.
 Jackson, E. R., 313.
 Jackson, M. L., 832.
 Jackson, R. F., 15.
 Jackson, R. W., 163.
 Jackson, S. H., 428.
 Jackson, T. W., 399.
 Jacob, A. W., 863.
 Jacob, K. D., 30, 632.
 Jacobs, D. L., 351.
 Jacobs, S. E., 101.
 Jacobson, K., 590.
 Jacobson, L., 36.
 Jacobson, L. A., 360.
 Jacobson, M., 155.
 James, H. D., 288.
 James, R. W., 590.
 James, W. H., 843.
 Jamison, F. S., 877.
 Jamison, V. C., 787.
 Janaki Ammal, E. K., 648.
 Jankiewicz, H. A., 387.
 Jann, G. J., 636.
 Janot, M. M., 180, 636.
 Jansen, E. F., 154.
 Jansen, J., 105.
 Jaques, H. E., 534.
 Jaquette, D. S., 718.
 Jardine, J. T., 142, 446, 447.
 Jarl, F., 712.
 Jarvis, F. G., 792.
 Jasny, N., 403.
 Jasper, D. E., 102, 387, 392, 565.
 Jasspon, W. H., 581.
 Jefferson, M. E., 456.
 Jeffrey, R. N., 154, 298.
 Jeffreys, C. E. P., 742.
 Jelinek, W. C., 138.
 Jellison, W. L., 369.
 Jenkins, A. E., 516, 679.
 Jenkins, C. F. H., 223, 686.
 Jenkins, D. L., 562, 563.
 Jenkins, J. M., Jr., 608.
 Jenkins, M. T., 824.
 Jenness, R., 133.
 Jennings, D. S., 312.
 Jenny, H., 783, 910.
 Jensen, D. D., 684, 820, 831, 837.
 Jensen, H. E., 387.
 Jensen, J. H., 513.
 Jensen, J. M., 851.
 Jensen, R., 854.
 Jerrel, E., 534.
 Jesnefs, O. B., 578, 579.
 Johansen, G., 633.
 John, K. T., 397.
 John, M. E., 446.
 Johns, D. M., 849.
 Johns, L., 898.
 Johnson, B. C., 276, 422, 429, 430, 600, 740.
 Johnson, C. M., 150, 155, 617, 774.
 Johnson, C. S., 465.
 Johnson, D. A., 487, 488.
 Johnson, D. G., 579, 581.
 Johnson, E. C., 441, 759.
 Johnson, E. M., 819.
 Johnson, E. W., 754.
 Johnson, F., 214, 346.
 Johnson, G., 306.
 Johnson, H. A., 93.
 Johnson, H. N., 396.
 Johnson, I. J., 185, 905.
 Johnson, J. A., 307, 813.
 Johnson, J. P., 352, 702.
 Johnson, L. E., 499.
 Johnson, L. P. V., 36, 187, 281, 667.
 Johnson, M. J., 14, 16, 321, 636, 792.
 Johnson, M. L., 277, 602.
 Johnson, N. W., 579.
 Johnson, P. E., 632.
 Johnson, P. R., 631.
 Johnson, R. C., 400.
 Johnson, R. E., 409, 624.
 Johnson, R. F., 92.
 Johnson, R. M., 222.
 Johnson, S. D., 854.
 Johnson, S. E., 868.
 Johnson, T., 342.
 Johnston, C., 615.
 Johnston, C. N., 107.

- Johnston, G. W., 180.
 Johnston, J. C., 821.
 Johnston, J. P., 840.
 Jolliffe, N., 181.
 Jones, A. L., 152.
 Jones, C. H., 180, 446.
 Jones, C. P., 131, 277, 413.
 Jones, D. D., 268.
 Jones, E., 130.
 Jones, E. E., 567.
 Jones, E. J., 777.
 Jones, F. G. W., 70.
 Jones, F. P., 841.
 Jones, G. D., 833.
 Jones, G. N., 816.
 Jones, H. A., 79, 216, 366, 520, 541.
 Jones, I. D., 123.
 Jones, J. H., 547, 748.
 Jones, J. M., 325, 547.
 Jones, J. S., 777.
 Jones, K. L., 218.
 Jones, L. A., 406.
 Jones, L. D., 718.
 Jones, L. M., 854.
 Jones, L. W., 785.
 Jones, M. A., 14, 296, 798, 832.
 Jones, M. T., 272.
 Jones, R. C., 665.
 Jones, R. W., 582, 583.
 Jones, S. E., 350.
 Jones, W. D. S., 590.
 Jordan, C. F., 101.
 Jordan, H. V., 808.
 Jordan, P. S., 800.
 Jordan, R. C., 101.
 Josephson, D. V., 385, 714.
 Joss, A., 724.
 Joyce, F. L., 88.
 Judkins, W. P., 50, 51, 485.
 Jugenheimer, R. W., 502.
 Jukes, T. H., 94, 549.
 Jull, M. A., 498, 499, 653, 707, 709.
 Jungherr, E. L., 567.
 Junnila, W., 862.
 Justice, C. L., 274.

 Kable, G. W., 258.
 Kaddery, W. L., 121.
 Kalckar, H. M., 761.
 Kalmus, H., 78.
 Kalogereas, S., 880, 881.
 Kanagy, J. R., 435.
 Kanegis, L. A., 389.
 Kaplan, M. M., 104.
 Karchmer, J. H., 151.
 Karling, J. S., 637.
 Karper, R. E., 810.
 Kassanis, B., 672.
 Kassell, B., 2.
 Kaswell, E. R., 434.
 Katz, M. S., 151.
 Kaucher, M., 265, 738.
 Kavanaugh, F., 313.

 Kay, H. D., 239.
 Kay, M. W., 722.
 Kearns, C. W., 79.
 Keegan, H. L., 369.
 Keen, B. A., 911.
 Keen, F. P., 364.
 Kelghley, G. L., 419.
 Kelm, F. D., 111.
 Kelkar, V. N., 309.
 Keller, W., 803.
 Kelley, E. G., 231, 772.
 Kelley, O. J., 170, 785, 807, 808.
 Kelley, R. B., 188.
 Kelly, J. T., 423.
 Kelly, W. C., 660.
 Kelsey, C. W., 571.
 Kelsey, F. E., 241.
 Kelty, R. H., 88.
 Kemmerer, A. R., 278, 597, 743, 802.
 Kemp, L., 875.
 Kemp, W. B., 527.
 Kemper, H. E., 543, 856.
 Kempster, H. L., 552.
 Kendelgh, S. C., 829.
 Kendrick, S. G., 137.
 Keng, P.-C., 34.
 Keng, Y.-L., 34.
 Kennard, D. C., 847.
 Kennedy, C. H., 221.
 Kent, G. C., 65, 343.
 Kenyon, A. E., 645.
 Kermack, W. O., 757.
 Kern, R., 746.
 Kernkamp, H. C. H., 565, 857.
 Kersten, H., 313.
 Kertesz, Z. I., 417, 444.
 Ketchen, J., 416.
 Ketterling, C. F., 760.
 Keuneman, J. L. H., 588.
 Key, K. H. L., 352.
 Keys, A., 131, 133, 626, 886.
 Kezer, A., 445.
 Kidder, R. W., 373.
 Kies, M. W., 762.
 Kieselbach, R., 151.
 Kightlinger, C. V., 812.
 Kik, M. C., 893.
 Kilgore, L. B., 80, 222.
 Killinger, G. B., 193.
 Kilmer, G. W., 8.
 Kimball, S. T., 732, 734.
 Kimmey, J. W., 58.
 Kincer, J. B., 629.
 Kindler, J. B., 365.
 King, C. C., 427.
 King, C. G., 127.
 King, G. B., 151.
 King, H. C., 476.
 King, H. H., 17, 157.
 King, R. L., 523.
 King, W. A., 236, 370.
 King, W. H., 8.
 King, W. V., 227, 698.
 Kingman, H. E., 546.

 Kinney, C., 873.
 Kinsey, V. E., 469.
 Kinsman, G. M., 590, 592.
 Kintzley, W. P., 253.
 Kirchner, J. G., 292, 742.
 Kirk, L. E., 756.
 Kirkpatrick, M. E., 882.
 Kirkwood, S., 766.
 Kirlin, E., 702.
 Kiser, O. M., 800.
 Kitchen, C. W., 760.
 Kitchen, H. B., 29.
 Kitson, R. E., 13, 150.
 Kizluta, Z., 790.
 Kleber, M., 126, 149.
 Klein, D., 618.
 Klein, G. T., 380.
 Klein, J. W., 725.
 Klemme, R. T., 117, 863.
 Kleshnin, A., 36.
 Kline, A. A., 153.
 Kline, L., 774.
 Klingman, D., 505.
 Klocke, J. F., 744.
 Klose, A. A., 591.
 Klosterman, E. W., 843.
 Klotz, L. J., 53, 346, 347.
 Klykov, A. P., 63.
 Knapp, B., Jr., 42, 324.
 Knaysl, G., 31, 178.
 Kneen, E., 290, 612, 613, 762.
 Knight, H. B., 4, 463.
 Knight, H. L., 912.
 Knight, K. L., 698.
 Knight, S. G., 314.
 Knippling, E. F., 368, 840.
 Knodt, C. B., 383, 496.
 Knowles, E., 285, 751.
 Knowles, E. E., 285.
 Knowlton, G. F., 77, 353, 444, 757, 831.
 Knox, C. W., 498.
 Knull, D. J., 221, 534.
 Knull, J. N., 688, 831.
 Ko, S. Y., 41.
 Koblitsky, L., 152.
 Kodicek, E., 295, 553.
 Koehler, B., 63, 502.
 Koehn, R. C., 266.
 Koffler, H., 314.
 Kolb, J. H., 873.
 Kolfenbach, J. J., 767.
 Komarov, A., 721.
 Kon, S. K., 556, 557.
 Konak, H., 244.
 Konst, H., 529.
 Koonce, D., 500.
 Koonz, C. H., 411.
 Koppanyi, T., 626.
 Kornberg, A., 284.
 Kosikowsky, F. V., 774.
 Krakower, C. A., 105.
 Kramer, A., 589, 770, 882.
 Kramer, B., 18, 421, 748.
 Kramer, H. K., 196.
 Kramer, M. M., 895.

- Kramer, P. J., 338.
 Krampitz, L. O., 464, 473.
 Krantz, F. A., 186.
 Kratzer, F. H., 235.
 Krauss, W. E., 98, 370, 381, 608, 849.
 Kreamer, E. A., 452.
 Krebs, E. T., Jr., 369.
 Kreeger, F. B., 456.
 Krehl, W. A., 135.
 Krettlow, K. W., 39.
 Kretschmer, C. B., 166.
 Krutser, W. A., 336, 345, 862.
 Krider, J. L., 43, 845.
 Krishan, R., 649.
 Krober, O. A., 469, 621.
 Krueger, K., 159.
 Krythe, J. M., 185.
 Kudo, R. R., 77.
 Kuhlman, G. W., 112, 113.
 Kuisenga, M. H., 248.
 Kulka, D., 635.
 Kumm, H. W., 228.
 Kuna, S., 388.
 Kurts, T., 175.
 Kutz, H. L., 369.
 Kusmeski, J. W., 94, 131, 413.
 Kyame, L., 14.
 Laake, E. W., 542.
 Labarre, J., 640.
 LaBelle, D., 352.
 Lacey, M. S., 314, 483.
 Lackey, C. F., 336, 515.
 Lafferty, O. W., 86.
 LaForge, F. B., 14, 222.
 Lager, A. E., 100, 104.
 Lagrone, W. F., 402, 863.
 Lahnum, W. H., 350.
 Laine, T., 84.
 Lamar, W. L., 300.
 Lamb, J., Jr., 311.
 Lamb, M. W., 275.
 Lambert, W. V., 608.
 Lambou, M. G., 472.
 Lamont, H. G., 396.
 Lampitt, L. H., 186.
 Lampman, C. E., 94, 708.
 Landauer, W., 802.
 Landes, M., 797.
 Landis, P. H., 409, 586, 867.
 Landsberg, M. I., 750.
 Lane, G. H., 862.
 Lang, A. L., 502, 808.
 Lang, E. H., 802.
 Lang, J. W., 570.
 Lange, W. H., 815.
 Lange, W. H., Jr., 82.
 Langford, G. S., 81, 687.
 Langley, L., 608.
 Langwill, K. E., 427.
 Lantz, E. M., 889.
 Lantz, H. L., 507.
 La Plante, A. A., Jr., 694.
 Lardy, H. A., 14.
 Large, E. C., 68, 672.
 Larsen, H. C., 406.
 Larsen, L., 111.
 Larsen, L. F., 758.
 Larsh, H. W., 511.
 Larson, A. L., 264, 581.
 Larson, E. J., 841.
 Larson, R. H., 216.
 Larsson, K. G., 477.
 Lascelles, H. R., 444.
 Laskowski, M., 614, 772.
 Lassiter, J. G., 608.
 Lathrop, E. C., 164, 165.
 Latta, R., 78, 364, 365.
 Laufer, M. A., 58, 761.
 Lauritzen, C. W., 570.
 Lavallard, M. F., 286.
 Lavin, G. I., 755.
 Lawrence, C. A., 713.
 Lawrence, J. F., 111.
 Lawrence, J. M., 265.
 Lea, C. H., 557.
 Leach, J. G., 58.
 Leach, L. D., 673.
 Leach, R., 519.
 Leahey, A., 755.
 LeBeau, F. J., 347, 827.
 Lederberg, J., 651.
 Ledingham, G. A., 900.
 Ledingham, R. J., 676.
 Lee, A. M., 717.
 Lee, A. R., 552.
 Lee, F. A., 775, 880, 881.
 Lee, H. N., 434.
 Lee, J. K., 864.
 Leech, H. B., 354.
 Lees, A. D., 229, 757.
 Lefebvre, C. L., 69, 819.
 Leffler, E., 744.
 Lehmann, E. W., 577.
 Lehmann, V. W., 524.
 Lehninger, A. L., 464.
 Lehrer, W. P., Jr., 92, 705.
 Lehrman, L., 3.
 Leighton, A., 558.
 Leith, B. D., 288.
 Lejeune, A. J., 648.
 LeMasurier, H. E., 551.
 Lemée, G., 347.
 LeMense, E. H., 634.
 Lemmon, A. B., 694.
 Lemon, P. C., 57.
 Lengel, J. H., 146.
 Lenhart, M. W., 406, 579.
 Leonard, O. A., 371.
 Leonard, R. H., 162.
 Lepkovsky, S., 555, 601.
 Lerner, I. M., 45, 498, 858.
 le Roux, P. L., 715.
 Leshner, M., 265.
 Leverton, R., 111.
 Leverton, R. M., 590, 885, 897.
 Levi, W. M., 711.
 Levin, E., 272.
 Levine, M., 307.
 Levine, M. N., 64.
 Levine, R., 837.
 Levine, R. S., 388.
 Levowitz, D., 713.
 Lewis, A. J., 466.
 Lewis, E. A., 230.
 Lewis, F. H., 510.
 Lewis, H., 891.
 Lewis, J. C., 148.
 Lewis, J. M., 374.
 Lewis, J. N., 590.
 Lewis, R. D., 446.
 L'Hote, H. J., 438, 439.
 Li, C. H., 3, 611.
 Li, H. W., 187.
 Lichstein, H. C., 768.
 Licht, W., Jr., 862.
 Lichty, D. L., 395.
 Lihnell, D., 217.
 Liljeblad, E., 81.
 Lillie, R. J., 567.
 Limbach, J. P., 669.
 Limber, D. P., 58.
 Liming, F. G., 687.
 Lincoln, R., 432.
 Lind, H. Y., 734.
 Lindahl, I., 840.
 Lindgren, C. C., 493.
 Linder, P. J., 814.
 Linderer, E. T., 404.
 Lindley, D. C., 377.
 Lindquist, A. W., 79, 85, 227, 366, 368, 529, 534, 541, 831.
 Lindquist, H. G., 240.
 Lineweaver, H., 5.
 Linsley, E. G., 535, 831.
 Lipmann, F., 761, 762.
 Lippincott, W. A., 234.
 List, G. M., 287, 693, 702.
 Liston, M., 111.
 Little, R. B., 391.
 Little, T. M., 216.
 Little, V. A., 807.
 Litwiller, E. M., 123.
 Liu, E.-L., 28.
 Live, I., 244.
 Lloyd, W. A., 447.
 Lo, T. Y., 749.
 Lochry, H. R., 713.
 Locke, L. F., 679, 754.
 Locke, W. F., 347, 819.
 Lockhart, E. E., 127.
 Lockwood, L. B., 163.
 Lombard, P. M., 503.
 Long, A. L., 632.
 Long, J. H., 313.
 Long, O. H., 660, 803.
 Longenecker, H. E., 762.
 Loo, S.-W., 489, 640.
 Loomis, C. P., 409.
 Loomis, J. K., 382, 552, 855.
 Loper, R., 111.
 Lopez, J. A., 626.
 Loree, R. E., 311.

- Lorens, F. W., 45, 258, 710.
 Lorens, R. W., 669.
 Loring, H. S., 611.
 Lorr, J. A., 882.
 Loughnane, J. B., 210.
 Louis, L., 595, 784.
 Love, A., 485.
 Love, D., 485.
 Love, H. H., 504, 803.
 Love, K. S., 632.
 Love, S. K., 399.
 Loveday, T., 410.
 Loveless, A. R., 337.
 Lovelock, J. E., 471.
 Lowe, J. L., 847.
 Lowe, R. C., 130.
 Lowery, G. H., Jr., 522.
 Lowman, M. S., 505.
 Lowrimore, B., 465.
 Lowry, O. H., 127, 600, 626.
 Lubber, D. H., 527.
 Lucas, C. C., 737.
 Lucas, E. H., 271.
 Lucas, H. L., 94, 707.
 Luckner, J. T., 563.
 Luckey, T. D., 549, 616, 846.
 Luddy, F. E., 456, 471.
 Luebke, B. H., 111, 729.
 Luecke, R. W., 128, 278.
 Lugg, J. W. H., 213.
 Luke, H. A., 780.
 Luke, W. J., 515.
 Lund, C. E., 578.
 Lund, E. R., 387.
 Lund, L., 433.
 Lundberg, W. O., 453, 465, 627.
 Lundblad, K., 207.
 Lundegardh, H., 321, 489.
 Lundy, G., 579.
 Lunt, H. A., 29.
 Lush, J. L., 43, 799, 844.
 Lutz, J. M., 58.
 Lyman, C. M., 179.
 Lynch, E. E., 86.
 MacArthur, J. W., 45, 188.
 MacCreary, D., 694.
 McDaniels, L. H., 331.
 MacDonald, A. D., 860.
 MacDonald, H. A., 256, 656.
 MacDougal, D. T., 642.
 MacDowell, L. G., 138.
 MacFarland, M. L., 594.
 MacGillivray, J. H., 815.
 MacGregor, J. M., 312, 810.
 Machacek, J. E., 62.
 Macht, D. I., 183.
 MacIlraith, J. J., 45.
 MacIntire, W. H., 480, 781.
 Mack, P. B., 284.
 Mackenzie, H. S., 620.
 MacKenzie, V. E., 889.
 Mackey, A. G., 900.
 Mackie, W. W., 502.
 Mackinney, G., 155, 878, 879.
 MacLay, W. D., 294.
 MacLeod, A., 579.
 MacLeod, F. L., 841.
 MacLeod, G., 427, 599.
 MacLeod, J., 543.
 MacMasters, M. M., 450, 451.
 MacMillan, C., 912.
 MacNay, C. G., 354.
 MacVicar, R., 796.
 Macy, H., 144, 612.
 Macy, I. G., 265, 274, 738.
 Madden, A. H., 227, 366, 368, 529, 541.
 Maddox, J. G., 581.
 Maddy, K. T., 396.
 Maderious, W. E., 387.
 Madhok, M. R., 479.
 Madsen, L. L., 271.
 Magee, A. C., 112.
 Magerlein, B., 8.
 Magie, R. O., 361.
 Magne, F. C., 147, 460.
 Magoon, C. A., 414.
 Mahadevan, S., 491.
 Mahoney, C. H., 288, 882, 891.
 Maki, T. E., 56.
 Makower, B., 161.
 Malanga, C., 107.
 Malcolm, J. L., 174.
 Maldonado Capriles, J., 229.
 Mallam, P. C., 716.
 Mallette, M. F., 878.
 Mallmann, W. L., 99, 126, 127.
 Mallow, A., 722.
 Malmquist, W. A., 387.
 Malone, C., 579.
 Malone, P. E., 406.
 Malone, T., 416.
 Malone, V., 428.
 Mamet, R., 352.
 Manalo, G. D., 675.
 Mandel, J., 1.
 Manges, D. E., 526.
 Manke, K. F., 195.
 Manley, G., 23.
 Mann, C. W., 164.
 Mann, G. E., 459.
 Mann, H. D., 800.
 Mann, L. B., 871.
 Mann, T. Barton, 106.
 Manns, T. F., 878.
 Mantle, C. C., 112, 404, 728, 729, 869.
 Marcellus, F. N., 551.
 Marchan, F. J., 669.
 Maren, T. H., 388.
 Margalef Lopez, R., 698.
 Mark, I., 864.
 Markham, L. C., 808.
 Marks, A. L., 882.
 Marks, H., 762.
 Markwood, L. M., 300.
 Marquardt, J. C., 98.
 Marrero, J., 206.
 Marriott, L. F., 632.
 Marsh, G. L., 270.
 Marsh, P. B., 484, 778.
 Marshall, C. E., 468.
 Marshall, E. K., Jr., 242.
 Marshall, H., 56.
 Marshall, J., 313.
 Marshall, J. B., 281, 416.
 Marshall, P. B., 248.
 Marshall, S. P., 377, 707.
 Marth, P. C., 51, 818.
 Martin, C. H., 535, 835.
 Martin, G. W., 315.
 Martin, H., 359.
 Martin, J. F., 819.
 Martin, J. H., 653.
 Martin, J. P., 171.
 Martin, W. H., 892.
 Martinez, M., 181.
 Martyn, E. B., 74, 519.
 Marvin, G. G., 299.
 Mason, A. C., 77.
 Mason, H. I., 792.
 Mason, K., 851.
 Mason, T. G., 644.
 Mast, W. C., 146.
 Masters, F. N., 112, 869.
 Mather, J. W., 408.
 Matheson, R., 366.
 Matlack, M. B., 271.
 Mathews, F. P., 101, 561.
 Matrone, G., 6.
 Matterson, L. D., 549.
 Matthes, F. E., 628.
 Matthews, E. M., 723.
 Matthews, M. T., 875.
 Matthews, R. E. F., 514.
 Matthyssse, J. G., 542, 838.
 Mattick, A. T. R., 99, 389, 557.
 Mattis, P. A., 106, 134.
 Mattson, H., 328.
 Mattson, M. L., 274.
 Mattson, S., 477.
 Maughan, A., 444.
 Maughan, J. H., 583.
 Maurer, F. D., 562, 563.
 Maxwell, J. M., 446.
 May, O. E., 141.
 Mayer, A. M., 18.
 Mayer, D. T., 800.
 Mayer, K., 388.
 Mayeux, L. C., Jr., 811.
 Mayfield, O. J., 567.
 Mayhew, R. L., 388.
 Maynard, L. A., 130, 265, 878.
 Mayo, S. C., 586, 732, 874.
 Mayor, V., 698.
 McAllister, M. L., 123.
 McArthur, I. S., 590.
 McCabe, M. M., 234.
 McCall, A. G., 631.
 McCall, E. R., 295, 842.
 McCall, K. B., 599, 600.
 McCalla, T. M., 27.
 McCallan, S. E. A., 508, 509.
 McCartney, J. A., 260, 582.

- McCartney, J. R., 890.
 McCay, C. M., 432, 739.
 McCay, J. B., 884.
 McClain, R. L., 819.
 McCloskey, C. M., 178.
 McClure, J. T., 310.
 McClymont, G. L., 708.
 McCulloch, L. P., 58.
 McCollum, E. V., 876.
 McCollum, J. P., 282.
 McCollum, W. C., 754.
 McColly, H. F., 722.
 McComb, A. L., 55.
 McConnell, W. J., 140.
 McCoy, J. W., 715.
 McCracken, E. C., 285.
 McCrary, C. M., 705.
 McCrory, S. A., 201, 202.
 McCubbin, W. A., 58.
 McCulloch, E. C., 93, 386.
 McDaniel, L. E., 636.
 McDarmid, A., 246, 390, 391, 503.
 McDonald, E. J., 15.
 McDonald, S., 242.
 McDonald, W. L., 254.
 McDowell, F. H., 244, 556.
 McEwen, A. D., 102.
 McFarlane, W. D., 266, 415, 611.
 McGeorge, W. T., 28, 29, 782.
 McGibbon, W. H., 95.
 McGinnis, J., 93, 550, 847.
 McGovran, E. R., 77, 684, 759, 832, 840.
 McGowan, J. C., 637.
 McGregor, M., 418.
 McGuffin, W. C., 364.
 McGuire, E. W., 595.
 McHargue, J. S., 29, 152, 273, 371, 372, 373, 887.
 McHenry, E. W., 594.
 McHenry, J. R., 481.
 McInteer, B. B., 182.
 McIntosh, T. P., 47.
 McKay, H., 590.
 McKay, H. H., 793.
 McKay, R., 345.
 McKee, R., 197, 660.
 McKenzie, R. E., 192.
 McKay, B. V., 240, 413.
 McKimmon, J. S., 446.
 McKinney, H. H., 39, 338.
 McKinney, K. B., 834.
 McKinney, R. S., 461, 462.
 McKinney, S. E., 106.
 McKnight, R. E., 573, 862.
 McLaughlin, C. B., 553.
 McLaughlin, F. A., 504.
 McLaughlin, J. H., 210, 214.
 McLean, D. D., 253.
 McLean, D. M., 677.
 McLean, I. W., Jr., 718.
 McLeod, D. H., 390.
 McMeekan, C. P., 89.
 McMeekin, T. L., 103.
 McMillan, R. T., 756.
 McMillan, T. J., 885.
 McMillen, W. N., 704.
 McNeill, E., 398, 568, 569.
 McNeill, J. M., 284, 790.
 McTaggart, A., 637.
 McVickar, M. H., 200, 723.
 McWhirter, L., 743, 888.
 Mead, S. W., 187, 410, 799.
 Meadows, D. T., 177.
 Means, R. H., 233, 371.
 Meeker, D., 760.
 Megrabjan, A. A., 34.
 Mehlich, A., 787.
 Mehliquist, G. A. L., 40.
 Mehren, G. L., 579, 724.
 Mehrhof, N. R., 96.
 Mehring, A. L., 632.
 Meinke, W. W., 278.
 Meinzer, O. E., 400, 861.
 Melasner, H. S., 571.
 Melander, A. L., 534.
 Melass, V. H., 378, 858.
 Melhus, I. E., 502.
 Melin, C. G., 381.
 Mello, M. T. de, 698.
 Mellon, E. F., 472.
 Mellon, M. G., 13, 150, 770.
 Melnick, D., 159, 424, 425, 426, 471, 598, 625.
 Melvin, B. L., 874.
 Melvin, R., 544.
 Menaker, M. H., 299.
 Meneely, G. R., 130.
 Merchant, C. H., 579.
 Meredith, W. O. S., 63.
 Merovka, L. J., 398.
 Merrill, R. C., 294.
 Merrill, R. C., Jr., 465.
 Merrill, T. A., 607.
 Merritt, P. P., 291.
 Mertz, E. T., 288.
 Mervine, E. M., 253.
 Meserve, E. R., 615.
 Metcalf, D., 319.
 Metcalf, E. R., 129.
 Metcalf, R. L., 79.
 Metzler, W. H., 406.
 Meyer, B. S., 419.
 Meyer, F. L., 595.
 Meyer, J., 33.
 Meyer, J. R., 485.
 Meyer, K., 761.
 Michaelis, L., 761, 763.
 Michaelis, M., 483.
 Michener, C. D., 544.
 Mickel, C. E., 836.
 Mickelsen, O., 626.
 Middleton, G. K., 192.
 Middleton, J. T., 843, 815.
 Midgley, A. R., 658.
 Milam, D. F., 427.
 Milam, F. M., 608.
 Milam, J., 77.
 Milbrath, D. C., 217.
 Milbrath, J. A., 824.
 Milby, T. T., 235.
 Miles, G. F., 671.
 Miley, D. G., 115, 579, 911.
 Millitzer, W., 613.
 Millitzer, W. E., 616, 620.
 Millenbruck, E. W., 386.
 Miller, A. A., 474.
 Miller, A. H., 348.
 Miller, A. W., 141.
 Miller, C. D., 595, 734.
 Miller, E. C., 128, 431.
 Miller, E. V., 666.
 Miller, F., 111.
 Miller, G. D., 380, 848, 849, 850.
 Miller, H. A., 38.
 Miller, H. W., 73.
 Miller, H. W., Jr., 356.
 Miller, J. C., 374.
 Miller, J. G., 108.
 Miller, J. H., 58.
 Miller, J. I., 444.
 Miller, L. B., 632.
 Miller, M. A., 358.
 Miller, M. F., 313, 438, 439, 785.
 Miller, P. R., 58.
 Miller, P. W., 58, 828.
 Miller, S., 265.
 Miller, V. L., 91.
 Millett, M. R. O., 205, 206.
 Millikan, C. R., 66.
 Mills, W. D., 345.
 Millthorpe, F. L., 678.
 Milne, A., 230.
 Milner, M., 512, 825.
 Milner, R. T., 472, 611.
 Milum, V. G., 89.
 Mims, V., 614, 748.
 Miner, F. D., 583.
 Minges, P. A., 815.
 Minneman, P. G., 911.
 Minor, E. S., 264.
 Minor, W. A., 760.
 Minteer, C. C., 111.
 Minz, G., 342.
 Miranda, F. de P., 127.
 Miranda, R. M., 844.
 Mirov, N. T., 205.
 Misner, E. G., 262, 405, 711, 798.
 Mitchell, A. K., 760.
 Mitchell, B. L., 535.
 Mitchell, D. T., 715.
 Mitchell, H. H., 29, 276, 292, 422, 430, 592, 594, 600, 740, 741.
 Mitchell, H. K., 35.
 Mitchell, H. L., 151, 768.
 Mitchell, H. S., 876.
 Mitchell, J. G., 701.
 Mitchell, J. H., 888.
 Mitchell, J. W., 320, 558, 813.
 Mitchell, K. J., 512.
 Mitchell, R. B., 252.
 Mitchell, R. L., 29.

- Mitchell, T. B., 702.
 Mitra, K., 275.
 Mittra, H. C., 275.
 Moffett, F. T., 465.
 Moldenke, H. N., 484.
 Molitor, H., 388.
 Monchadsky, A., 228.
 Monge, L., 374.
 Monroe, H. A. U., 356.
 Monroe, C. F., 98, 370, 381, 849.
 Montgomery, B. E., 80.
 Moody, F. J., 750.
 Mooers, C. A., 446, 754, 803.
 Moon, H. H., 50, 51.
 Moore, A. V., 622, 851.
 Moore, D. C., 203.
 Moore, E. L., 138.
 Moore, E. N., 387, 860.
 Moore, F. J., 67.
 Moore, G. R., 392, 854.
 Moore, H. R., 110.
 Moore, J. A., 228.
 Moore, J. C., 57, 219, 872.
 Moore, L. A., 232.
 Moore, M. B., 338.
 Moore, O., 263, 606, 724.
 Moore, O. K., 96.
 Moore, P. R., 549, 616, 846.
 Moore, R. C., 888.
 Moore, R. H., 794.
 Moore, R. L., 252.
 Moore, R. P., 192.
 Morales, J. O., 727.
 Moran, A. B., 389, 853.
 Morcos, Z., 394.
 Moreaux, R., 369.
 Morehouse, N. F., 567.
 Moreira, J., 105.
 Moreland, C. F., 38.
 Morell, S. A., 165.
 Morgan, A. F., 279, 387, 597, 601, 876.
 Morgan, B. B., 88, 242, 245, 887, 522.
 Morin, G., 444.
 Morofsky, W. F., 683.
 Morrell, C. A., 423.
 Morrell, E., 841.
 Morrill, C. C., 100.
 Morrill, D. R., 855.
 Morris, D. L., 15.
 Morris, V. H., 289, 290.
 Morrison, B. V., 284.
 Morrison, F. B., 848, 855.
 Morrison, H. B., 850.
 Morrow, E. B., 665.
 Morse, E. C., 284.
 Mortensen, O. A., 521.
 Moscoso, R. M., 181.
 Moseley, O., 179.
 Moses, B. D., 110, 710.
 Moses, H. E., 567.
 Mott, L. O., 243, 247, 710.
 Mottern, H. H., 161.
 Motzok, I., 552.
 Moulton, J. E., 320.
 Moutla, L. A., 352.
 Movitt, E., 129.
 Mowry, H., 272, 901.
 Moxon, A. L., 789, 794.
 Moyer, A. J., 32.
 Moyer, E. H., 134.
 Moyer, E. Z., 265, 738.
 Moyer, J. C., 125, 272, 880.
 Moyer, R. T., 262.
 Mrak, E. M., 126, 270, 417, 878, 879.
 Mueller, C. D., 497.
 Mueller, G. P., 8.
 Muesebeck, C. F. W., 831.
 Muhrer, M. E., 234.
 Muhsam, H. V., 686.
 Mujica, R., F., 315.
 Mullen, F. E., 398.
 Müller, G. H., 763.
 Mulloy, G. A., 755.
 Muma, M. H., 81, 527.
 Mumford, D. C., 112, 113.
 Mumford, F. B., 758.
 Munck, C., 826.
 Muncie, E. H., 757.
 Mundinger, F. G., 361, 835.
 Munks, B., 265.
 Munn, M. T., 329, 333, 813.
 Munro, J. A., 211, 684.
 Munro, S. S., 498.
 Munsell, H. E., 747.
 Munson, S. C., 85, 539.
 Munz, P. A., 34.
 Murley, M., 316.
 Murley, M. R., 484.
 Murneek, A. E., 35.
 Murphy, E., 661, 897.
 Murphy, H. F., 754.
 Murray, A. W., 392.
 Murray, C. W., 8.
 Murray, M. A., 319.
 Murray, W. G., 413.
 Muse, M., 751.
 Musgrave, A. J., 900.
 Musgrave, R. B., 328.
 Mushett, C. W., 388.
 Musil, A. F., 808.
 Muskett, A. E., 69.
 Mussehl, F. E., 378, 547, 846.
 Mustakas, G. C., 164.
 Muth, O. H., 855.
 Mutinelli, A., 359.
 Myers, H. E., 445.
 Myers, R. P., 713.
 Myers, W. G., 32.
 Myers, W. I., 908.
 Mystkowski, E. M., 132.
 Nachmansohn, D., 761.
 Naden, K. D., 408.
 Nagel, C. M., 70.
 Naghski, J., 9, 162.
 Nalbandov, A. V., 189.
 Nance, N. W., 819.
 Nash, H. A., 615.
 Navashin, M. S., 184.
 Neal, N. P., 193.
 Neal, P. A., 223.
 Needham, N. V., 313.
 Neergaard, P., 60.
 Neher, B. H., 189, 801.
 Neilson-Jones, W., 519.
 Nelsh, A. C., 900.
 Nelson, A. G., 725.
 Nelson, J. A., 849.
 Nelson, J. M., 878.
 Nelson, L., 586.
 Nelson, M. H., 632.
 Nelson, O. E., Jr., 38, 640.
 Nelson, P., 865.
 Nelson, P. M., 590.
 Nelson, R., 344.
 Nelson, W. L., 603, 662, 807, 878.
 Nesbit, W. B., 606.
 Nesbitt, H. H. J., 365.
 Ness, A. R., 755.
 Nesse, S., 716.
 Nestler, R. B., 525.
 Neu, L., 104.
 Neumayer, E. M., 563.
 Nevskaya, Z. L., 359.
 Newcombe, B., 123.
 Newcomer, E. J., 363.
 Newcum, K. M., 724.
 Newhall, A. G., 819, 825.
 Newman, L. H., 755.
 Newman, M. S., 8.
 Newton, J. H., 693.
 Newton, M., 63, 342.
 Nicholas, D. J. D., 58, 509.
 Nicholas, J. E., 124, 880.
 Nicholls, W. H., 579, 581.
 Nichols, A. A., 99, 557.
 Nichols, M. L., 152.
 Nicholson, J. A., 386.
 Nickels, C. B., 684.
 Nickerson, D., 11, 433.
 Nielsen, E. L., 197.
 Nielsen, J. L., 722.
 Nielsen, J. P., 301.
 Nielsen, L. W., 24.
 Nigrelli, R. F., 351.
 Nitchals, R., 744.
 Niven, C. F., Jr., 790, 791.
 Nixon, W. M., 754.
 Nobecourt, P., 488.
 Noble, I., 282.
 Noceda, H. Garcia de la, 745.
 Noel, W. A., 414.
 Nolf, L. O., 351.
 Nord, F. F., 347, 762.
 Nordskog, A. W., 42, 324.
 Norman, A. G., 607, 809.
 Norris, D. O., 336.
 Norris, L. C., 93, 94, 95, 421, 428, 551, 616, 707, 846.
 North, W. R., 11.
 Northern, H. T., 323.
 Norton, C. L., 382, 552.
 Norton, J. B. S., 180.

- Norton, L. B., 9.
 Norton, L. J., 579, 581.
 Nottingham, E., 358.
 Novikov, V. A., 185.
 Nowak, J. F., 108.
 Nunes Meléndez, E., 55.
 Nusbaum, C. J., 819.
 Nutman, P. S., 638, 651.
 Nutt, G. B., 253.
 Nutting, A. D., 84.
 Nuttonson, M. Y., 168.
 Nygren, A., 651.
 Nylund, R. E., 202.
 Nystérakis, F., 73.
 Oakberg, E. F., 326.
 Obermeyer, H. G., 430, 431.
 O'Brien, J. E., 713.
 Ochoa, S., 761.
 O'Connor, R. T., 161, 302.
 O'Donnell, W. W., 281.
 Oettingen, W. F. von, 223.
 Ogg, C. L., 6, 154, 302.
 Oglesbee, R. E., 461.
 Ogloblin, A. A., 534.
 O'Grady, M. K., 737.
 Ogston, A. G., 340, 341.
 Ohlson, M. A., 590.
 O'Kane, D. J., 634.
 O'Kelly, J. F., 196.
 Olafson, P., 855.
 Olbrycht, T. M., 703.
 Olcott, H. S., 161.
 Oldham, F. K., 241.
 Oldroyd, D. M., 770.
 Olesen, R., 75.
 Oleson, A. P., 162.
 Oleson, J. J., 94, 549.
 Olive, L. S., 69, 607.
 Oliver, G. D., 298, 455, 456, 460.
 Olivier, L. G., 569.
 Olney, J. F., 565.
 Olsen, O. W., 387, 856.
 Olson, A. R., 572.
 Olson, B. H., 636, 792.
 Olson, C., Jr., 566, 758.
 Olson, F. C., 712.
 Olson, G., 880.
 Olson, G. A., 446.
 Olson, J. C., Jr., 612.
 Olson, L. C., 24.
 Olson, R. E., 99.
 Olson, T. A., 522.
 Olson, W. J., 166, 473.
 Olsson, N., 710.
 Oman, P. W., 830.
 O'Neill, W. J., 362.
 Ong, E. R., de, 517.
 Oosting, H. J., 333.
 Orcutt, F. S., 634.
 Ordal, E. J., 177.
 Orent-Kelles, E., 470, 598.
 O'Rourke, F. L., 49.
 Orr, W., 897.
 Ortega, C. J., 606.
 Orten, A. U., 593, 737.
 Orten, J. M., 593, 737.
 Orwin, C. S., 444.
 Osborn, E. M., 483.
 Osborn, W. M., 663, 754.
 Osburn, M. R., 696.
 Oser, B. L., 159, 424, 425, 426, 471, 598, 625.
 Osgood, O. T., 262, 866.
 Osmun, J. V., 86.
 Osorio, L. H., 23.
 Osorno-Mesa, E., 228.
 Ossianilsson, F., 211.
 Oster, G., 208.
 Ostrom, C. E., 55.
 Oswalt, R. M., 663, 757, 812.
 Otero, A. R., 532.
 Ott, W. H., 134, 248.
 Ottaway, C. W., 395.
 Otto, G. F., 388.
 Ouboter, de Bruyn, M. P., 74, 75, 514.
 Outwater, C. H., 713.
 Overbeek, J. van, 35.
 Overcash, J. P., 817.
 Overholser, E. L., 418.
 Overholts, L. O., 347.
 Overstreet, R., 36.
 Owen, C. R., 848.
 Oyaas, J., 321.
 Paarlberg, D., 578.
 Pack, F. C., 302, 462.
 Packard, F. M., 219.
 Packman, D. F., 544.
 Pagan, C., 798.
 Page, A. B. P., 357.
 Painter, E. P., 463.
 Pal, R., 699.
 Paley, C., 713.
 Pallares, E. S., 347.
 Palm, C. E., 358.
 Palmer, K. J., 293, 294, 450.
 Palmer, L. J., 349.
 Palmer, L. S., 133.
 Palmer, M. A., 77.
 Palmer, V. J., 754.
 Palmiter, D. H., 72.
 Pao, W. K., 187.
 Paraense, W. L., 87.
 Parcher, L. A., 863.
 Parish, H. E., 533.
 Parker, E. D., 2, 164.
 Parker, F. W., 632.
 Parker, J. E., 379, 444.
 Parker, M. W., 781.
 Parker, R. L., 360, 364.
 Parkhurst, R. T., 94.
 Parkin, I. E., 713.
 Parkinson, J. F., 590.
 Parkinson, L. R., 240.
 Parkinson, T. L., 136, 280.
 Parks, R. Q., 150.
 Parks, T. H., 834.
 Parrish, D. B., 156, 892.
 Parrish, E., 855.
 Parsons, H. T., 277, 744.
 Parsons, K. H., 578.
 Parvin, D. W., 114, 287, 911.
 Paschal, J. L., 862.
 Paschke, R. F., 462.
 Pascoe, E. D., 289, 290.
 Patch, E. A., 106.
 Pate, V. S. L., 855.
 Patterson, E. K., 230.
 Patterson, J. B. E., 672, 704.
 Patterson, R. E., 325.
 Patterson, W. I., 16.
 Patteson, G. W., 260, 582, 728.
 Pattison, I. H., 392.
 Patton, A. R., 756.
 Patton, E. W., 746.
 Patton, J. G., 760.
 Patton, M. B., 482.
 Patton, R. L., 702.
 Paul, B. H., 668.
 Pavcek, P. L., 423.
 Pawson, H. C., 374.
 Paxson, E. M., 248.
 Payne, J. H., 294.
 Payne, M., 667.
 Payne, M. G., 287, 304, 546.
 Payne, N. M., 365.
 Peace, T. R., 779.
 Peacock, P. R., 326.
 Peacock, W., 130.
 Peairs, L. M., 533.
 Pearce, E., 351.
 Pearce, J. A., 415, 416.
 Pearce, W. E., 125.
 Pearson, E. O., 535.
 Pearson, F. A., 578.
 Pearson, G. A., 668.
 Pearson, P. B., 98, 128, 278, 378, 858.
 Peay, W. E., 693, 757.
 Peck, J. L., 247.
 Peck, O., 224.
 Pederson, C. S., 307, 444, 897.
 Pedreira, A. S., 757.
 Peech, M., 787.
 Peoples, L., 700.
 Peet, L. J., 285.
 Peffy, R. L., 698.
 Peirson, H. B., 84.
 Penau, H., 686.
 Penfound, W. T., 541.
 Pennington, D., 622.
 Penny, N. M., 404, 871.
 Pepper, B. B., 690.
 Pepper, J. O., 531, 690.
 Perkins, N. L., 285.
 Perlín, A. S., 483.
 Perlman, D., 14.
 Perlman, L., 279.
 Perlzweig, W. A., 148, 745.
 Perry, A. L., 580.
 Perry, E. J., 851.
 Perry, R. L., 270.
 Perry, W. J., 86, 367.
 Personius, C. J., 412.

- Peters, J. J., 324.
 Petersen, C. F., 94, 707, 708.
 Petersen, W. E., 102, 388, 391.
 Peterson, D. C., 357.
 Peterson, G. T., 417.
 Peterson, H. B., 312.
 Peterson, J. B., 169, 788.
 Peterson, M. S., 111.
 Peterson, R. F., 163.
 Peterson, W., 446.
 Peterson, W. H., 159, 166, 241, 612, 744.
 Peterson, W. J., 121, 160, 742, 884.
 Petrides, G. A., 829.
 Petrova, O. A., 643.
 Pett, L. B., 590.
 Pettet, F. W., 225.
 Pettijohn, O. G., 766.
 Pettit, R. H., 445.
 Peturson, B., 63.
 Pfeffer, S., 640.
 Phaff, H. J., 126, 270, 417.
 Phelps, E. L., 284.
 Phillips, C. D., 579.
 Phillips, C. E., 247.
 Phillips, E. F., 607.
 Phillips, E. S., 816.
 Phillips, M., 6.
 Phillips, M. G., 132.
 Phillips, P. H., 130, 283, 420, 421, 596, 766, 800.
 Phillips, R. E., 653.
 Phillips, R. W., 42, 44, 188, 325, 703.
 Phillips, S. F., Jr., 865.
 Phillips, W. H., 330.
 Phillipson, A. T., 372.
 Picken, M. B., 435.
 Pickett, B. S., 476, 608, 903.
 Pickford, G. D., 501.
 Pickles, A., 84.
 Pierce, C. W., 581.
 Pierce, J. G., 611.
 Pierce, W. C., 538.
 Piercy, P. L., 241.
 Piercy, S. E., 230.
 Pierson, J., 107.
 Piskovski, M., 396.
 Pilgrim, F. J., 744.
 Pinck, L. A., 480, 811.
 Pincus, G., 761.
 Pine, W. H., 144.
 Piquett, P. G., 77.
 Pirie, N. W., 340, 341.
 Pissarev, V. E., 649.
 Pitesky, I., 165.
 Pitner, J., 177, 633, 654.
 Pitt, D. T., 53.
 Pittman, D. W., 173, 784.
 Pittman, M. S., 590.
 Plagge, H. H., 398.
 Plank, H. K., 296, 336.
 Plank, J. E., van der, 503.
 Plank, N., 645.
 Plastring, W. N., 98, 391.
 Platt, A. W., 688.
 Platt, B. S., 588.
 Platt, C. S., 378, 578.
 Plow, R. H., 22.
 Plummer, P. J. G., 86, 245, 529.
 Pohlman, G. G., 192, 476.
 Polgar, A., 615.
 Pollak, L. W., 629.
 Pollard, E. F., 147.
 Pollard, L. H., 330.
 Pollari, V. E., 413.
 Polskin, L. J., 748.
 Polson, R. A., 873.
 Pomeroy, B. S., 245.
 Pons, W. A., Jr., 773.
 Pont, E. G., 385.
 Ponting, J. D., 306.
 Pool, M. F., 155, 418, 468.
 Pope, J. B., 631.
 Pope, M. N., 805.
 Porter, C. L., 32.
 Porter, J. J., 759, 855.
 Porter, J. R., 178.
 Porter, J. W., 193, 756.
 Porter, R. H., 200.
 Porter, T., 133, 744.
 Porter, W. L., 154.
 Post, A. H., 501.
 Potter, G. F., 332.
 Potter, P. B., 285.
 Povar, M. L., 544.
 Powell, D., 670.
 Powell, R. D., 646.
 Powers, J. J., 124, 271.
 Prat, H., 640.
 Prater, A. N., 155, 292, 468.
 Pratt, D. B., 31.
 Pratt, J. P., 265.
 Pratt, R., 483, 636.
 Prentice, I. W., 678.
 Presley, J. T., 186, 675, 679, 680.
 Pressly, H. B., 884.
 Preston, D. A., 57, 58, 336.
 Preston, F. W., 350.
 Preston, R. J., 206.
 Preston, R. J., Jr., 818.
 Preston, R. K., 9.
 Priadilshchikova, T. D., 184.
 Price, E. W., 387.
 Price, W. A., 77.
 Price, W. C., 58, 71, 468.
 Price, W. V., 241, 730.
 Prickett, C. O., 396.
 Pridham, A. M. S., 814.
 Prince, A. L., 174.
 Pringle, E. M., 96.
 Pringle, R. B., 611.
 Pringsheim, E. G., 637.
 Privett, O. S., 611.
 Procter, E. Q., 819.
 Proctor, R. E., 579.
 Prokofiev, A. A., 184.
 Promersberger, W. J., 444, 722.
 Provost, R. C., Jr., 6.
 Pryor, D. E., 215.
 Pryor, H., 875.
 Pucher, G. W., 766.
 Pugsley, L. I., 423.
 Pullin, J. W., 244.
 Putman, W. L., 223.
 Pyenson, H., 558.
 Pyenson, L., 684.
 Pyke, W. E., 267.
 Quackenbush, F. W., 266, 389, 418, 775.
 Qualife, M. L., 627.
 Quate, G. S., 667.
 Queen, F. B., 398.
 Quinby, J. R., 810.
 Quinn, V. P., 602.
 Quisenberry, J. H., 759.
 Quisenberry, K. S., 822.
 Quortrup, E. R., 398.
 Rader, L. F., Jr., 30.
 Radford, C. D., 229.
 Radlove, S. B., 462, 772.
 Ragsdale, A. C., 98.
 Rahn, E. M., 266, 330.
 Rahn, O., 99.
 Rakitin, J. V., 38.
 Raleigh, G. J., 29, 506.
 Rama Rao, T. S., 700.
 Ramaswamy, R., 491.
 Ramdas, K., 491.
 Ramser, J. H., 577.
 Ramsey, G. B., 344.
 Ramsey, L. L., 16.
 Ramsey, R. C., 154.
 Rand, F. V., 142.
 Randolph, L. F., 6.
 Randolph, W. L., 760.
 Ranganathan, B., 41, 646.
 Rankin, J. S., Jr., 830.
 Rannefeld, A. N., 157.
 Rao, M. N., 420.
 Rao, T. R., 700.
 Rao, T. S. Rama, 700.
 Rao, V. V., 698.
 Raper, K. B., 791.
 Rapp, J. L. C., 180, 221.
 Rapp, K. E., 371, 372, 373.
 Rapp, W. F., Jr., 180, 221, 353, 686.
 Raskopf, B. D., 407, 538, 870.
 Rasmussen, E. J., 72.
 Rasmussen, K., 497.
 Rasor, H. L., 264.
 Ratchford, W. P., 146.
 Rau, P., 84, 222.
 Rausch, R., 251, 522, 682.
 Rawlins, T. E., 674.
 Rawlins, W. A., 80, 680.
 Raynor, R. N., 48.
 Rebman, E. F., 263.
 Redd, J. B., 305.

- Redfield, G. M., 285.
 Redlinger, L., 534.
 Reece, P. C., 493.
 Reece, R. P., 801.
 Reed, D. L., 164.
 Reed, E. C., 111.
 Reed, G. M., 60.
 Reed, H. J., 760.
 Reed, H. M., 882.
 Reed, O. E., 141.
 Rees, D. M., 86.
 Reeve, R. M., 647.
 Reeves, R. G., 323.
 Reeves, W. C., 367.
 Regan, C. J., 182.
 Regan, W. M., 187, 799.
 Rehn, J. A. G., 80.
 Reid, D. F., 555.
 Reid, D. H., 759.
 Reid, E. H., 501.
 Reid, J. D., 10, 149.
 Reid, J. T., 382.
 Reid, M., 415.
 Reid, T. S., 163.
 Reid, W. D., 512.
 Reid, W. M., 397.
 Reilly, H. C., 304, 791.
 Reineke, E. P., 372, 449.
 Reinhard, H. J., 687.
 Reiss, F., 195.
 Reitemeier, R. F., 149, 171, 478.
 Remsburg, J. H., 712.
 Rensburg, S. W. J. van, 553.
 Restarski, J. S., 739.
 Retzer, J. L., 281.
 Reutner, T. F., 855.
 Revell, S. H., 649.
 Rewald, B., 453.
 Reynolds, D. S., 30.
 Reynolds, E. B., 196.
 Reynolds, L., 274.
 Reynolds, M. S., 590.
 Rhoads, A. S., 670.
 Rhodes, H. E., 861.
 Rhodes, R. R., 759.
 Ribbands, C. R., 367.
 Rice, K. K., 136, 279.
 Rice, L. A., 348.
 Rice, P. L., 356, 694.
 Richards, A. G., 529.
 Richards, A. G., Jr., 230.
 Richards, A. J., 265, 738.
 Richards, D. E., 843.
 Richards, M. C., 665.
 Richardson, B. T., 875.
 Richardson, C. H., 77.
 Richardson, H. H., 365.
 Richardson, L. R., 552.
 Richter, C. P., 136, 279, 350, 419, 854.
 Rickard, C. G., 102.
 Ricker, P. L., 34, 484.
 Ricker, W. E., 80.
 Rider, B. F., 770.
 Riedel, B. B., 888.
 Riemann, E. H., 350.
 Riemann, W., III, 300.
 Riemenschneider, R. W., 453, 456, 457, 461, 462, 464, 471.
 Riester, D. W., 125.
 Rietz, E., 154.
 Rigdon, R. H., 710.
 Rigler, N. E., 65.
 Riker, A. J., 59, 675, 793.
 Riley, N. D., 85.
 Riley, R. L., 684.
 Rinehart, J. F., 471.
 Riner, M. E., 187.
 Rinke, E. H., 194, 494.
 Riser, W. H., 248.
 Risley, E. B., 504.
 Ritcher, P. O., 819.
 Ritchey, G. E., 660.
 Rittenberg, D., 761.
 Ritter, E. De, 160.
 Roach, R. W., 391.
 Roach, W. A., 509.
 Roark, R. C., 222, 527.
 Robbins, W. A., 200.
 Robbins, W. J., 313.
 Robbins, W. R., 702, 781.
 Roberts, A. L., 115.
 Roberts, C., 61, 489, 674.
 Roberts, E., 43.
 Roberts, E. J., 2, 164.
 Roberts, I. H., 543, 856.
 Roberts, J., 705.
 Roberts, R. E., 848.
 Roberts, R. H., 50, 795.
 Roberts, S. J., 100, 560.
 Roberts, W. C., 701.
 Robertson, A., 397.
 Robertson, D. W., 177, 445.
 Robertson, E. I., 846.
 Robertson, L. S., 47.
 Robey, T. O., 563.
 Robinson, A., 265.
 Robinson, E., 380.
 Robinson, G. G., 230.
 Robinson, H. E., 121.
 Robinson, J. L., 23, 195, 583.
 Robinson, L., 706.
 Robinson, P. F., 624.
 Robinson, W. B., 626, 817.
 Robinson, W. O., 29, 788.
 Robison, P., 469.
 Robison, R. S., 30.
 Rockenmacher, M., 421.
 Rockey, J. W., 724.
 Rockland, L. B., 14, 15, 618.
 Roderuck, C. E., 265.
 Rodney, G., 449.
 Rodwell, A. W., 390.
 Roe, E. T., 454.
 Roeder, K. D., 227.
 Roepke, M. H., 245, 389, 565.
 Rogers, J. S., 164.
 Rogers, L. H., 152.
 Rogers, T. H., 32.
 Rogler, G. A., 656.
 Rogoff, W. M., 540.
 Rogosa, M., 713.
 Roholt, K., 634.
 Rohrbaugh, P. W., 217, 346.
 Rolfe, D. M., 544.
 Rollins, R. C., 39.
 Romney, V. E., 830.
 Romshe, F. A., 757.
 Root, H. F., 594.
 Ropp, R. S., de, 318, 390.
 Rose, D., 723.
 Rose, M., 394.
 Rosen, H. R., 511.
 Rosenberg, G., 507.
 Rosenfeld, I., 559.
 Ross, A. F., 690.
 Ross, E., 590.
 Ross, J. G., 186.
 Ross, W. H., 145, 632.
 Rossetti, V., 679, 681.
 Rossoff, I., 558.
 Rost, C. O., 312, 810.
 Rostorfer, H. H., 710.
 Roth, D. A., 611.
 Roth, L., 366.
 Rothchild, I., 190.
 Rouchdy, A., 393.
 Rouse, C. H., 349.
 Rozeboom, L. E., 698.
 Rozman, D., 804.
 Rubin, M., 547.
 Rubin, S. H., 134, 100.
 Rucker, J. C., 399.
 Ruckman, J. E., 459.
 Rude, C. S., 533.
 Ruderman, A. P., 724.
 Rudolfs, W., 108.
 Rudolph, F., 25.
 Ruegamer, W. R., 10, 395.
 Rummell, R. S., 327.
 Runnalls, M. E., 139.
 Runnels, T. D., 759.
 Rusoff, L. I., 241, 849.
 Russell, B., 755.
 Russell, G. A., 807.
 Russell, J. C., 722.
 Russell, R. J., 629.
 Rust, R., 265.
 Ruth, W. A., 269.
 Rutherford, R. M., 681.
 Ryan, F. J., 1, 2, 651.
 Ryff, J. F., 717.
 Rygg, G. L., 204.
 Sabet, Y. S., 639.
 Sabrosky, C. W., 86, 348.
 Saburova, P. V., 338.
 Saccas, A., 38.
 Saeman, J. F., 21, 22, 153, 162.
 Sager, O. S., 20, 713.
 Saidel, L. J., 2.
 St. Clair, L. E., 607.
 St. George, E. A., 604.
 St. John, J. L., 20, 156, 300.
 Salcedo, J. Jr., 129.

- Sales, J. F., de, 105.
 Sallsbury, G. W., 238, 496, 842.
 Salle, A. J., 636.
 Salter, L. A., Jr., 288.
 Salter, R. M., 142.
 Sampson, J., 100, 238.
 Samuel, L., 757.
 Sanborn, R., 380.
 Sanders, C. F., 385.
 Sanders, D. A., 855.
 Sanders, G. P., 20, 713.
 Sanders, M., 857.
 Sanders, S. D., 118.
 Sanderson, D., 873.
 Sandholzer, L. A., 85.
 Sands, J. E., 434.
 Sandstedt, R. M., 297, 612, 702.
 Sandstrom, W. M., 762.
 Sansome, E. R., 41, 651.
 Sarel Whitfield, F. G., 531.
 Sarett, H. P., 160, 179, 279, 601.
 Sargent, F., 624.
 Sarkar, B. C. R., 545.
 Sarle, C. F., 630.
 Sartory, A., 33.
 Sater, E., 285.
 Sater, L., 285.
 Sauterlich, H. E., 610.
 Sautter, J. H., 387.
 Savage, D. A., 754.
 Savich, T. R., 296.
 Sayre, C. B., 330, 814, 877.
 Scales, J. W., 287, 564, 717, 756.
 Scalf, R. E., 313.
 Scanlan, J. T., 4, 294.
 Scaramuzza, L. C., 532.
 Schaal, L. A., 514.
 Schaeffer, B. B., 454.
 Schaevitz, J., 598.
 Schaffer, P. S., 384, 386.
 Schaffer, W., 474.
 Schalk, A. F., 841.
 Schaller, C. W., 671.
 Schaller, F. W., 192.
 Schalm, O. W., 391.
 Schatz, A., 791.
 Schechter, M. S., 149, 305.
 Schell, I. I., 23, 310, 474.
 Schickele, R., 581, 724.
 Schlehuber, A. M., 663.
 Schmidt, W. H., 32.
 Schmieder, R. G., 370.
 Schneberger, E., 76.
 Schneider, A., 8.
 Schneider, H., 846.
 Schneider, M. D., 389, 398.
 Schnetzler, E. E., 46, 234, 236.
 Schniepp, L. E., 164, 165.
 Schoffmayer, V., 272.
 Schoffman, R. J., 528.
 Schofield, F. W., 561.
 Scholfield, C. R., 460.
 Scholz, R., 608.
 Schorger, A. W., 76.
 Schott, F. M., 686.
 Schott, H. F., 15.
 Schott, R. G., 42, 188.
 Schrader, F. F., 475.
 Schrader, F. M., 755.
 Schread, J. C., 352.
 Schreiber, W. R., 204.
 Schrenk, W. G., 17, 157.
 Schroeder, H. O., 227, 366, 831.
 Schroeder, W. T., 819.
 Schubert, F. J., 89.
 Schuck, C., 274.
 Schuette, H. A., 89, 463, 611, 620.
 Schuler, F. B., 352.
 Schulte, B. H., 873.
 Schultz, A. S., 762.
 Schultz, G., 873.
 Schultz, H. K., 827.
 Schultz, T. W., 578, 724.
 Schultze F., E. S., 104.
 Schulz, J. A., 594.
 Schuman, R. L., 160.
 Schuster, C. E., 173, 828.
 Schuster, G. L., 900.
 Schuster, M. L., 758.
 Schwaradt, H. H., 366, 840.
 Schwarz, E., 44.
 Schweigert, B. S., 130, 179, 420, 421, 608, 610.
 Schweinburg, F. B., 105.
 Schwenger, R. B., 578.
 Schwitzgebel, R. B., 697.
 Sciarini, L. J., 347.
 Scott, C. L., 285.
 Scott, D. H., 187.
 Scott, H. M., 549, 551.
 Scott, J. A., 351.
 Scott, K., 760.
 Scott, L. B., 77.
 Scott, L. E., 891.
 Scott, M. L., 616.
 Scoular, F. I., 602.
 Scranton, L. L., 722.
 Scrase, F. J., 309.
 Scrivner, L. H., 252.
 Seaman, E. A., 522.
 Searight, W. V., 789.
 Seath, D. M., 380, 848, 849, 850.
 Sebrell, W. H., 127, 284, 762.
 Secrest, E., 752.
 Seegal, B. C., 180.
 Seeger, K. C., 858.
 Seeler, A. O., 107, 248.
 Seeley, H. W., Jr., 98.
 Seem, W. P., 435.
 Seghetti, L., 858.
 Seguinot Robles, P., 818.
 Segura, C. Bazan de, 671.
 Seibold, H. R., 387.
 Seidel, M. K., 772.
 Seifriz, W., 87.
 Seiglinger, J. B., 754.
 Semenink, G., 337, 502.
 Sen, K. C., 545.
 Sen, N. K., 493.
 Sen Gupta, J. C., 493.
 Senior, B. J., 397.
 Senior White, R., 698.
 Serr, E. F., 205.
 Serrano, P., 745.
 Setzer, J., 310.
 Sevag, M. G., 762.
 Severin, H. C., 221.
 Severin, H. H. P., 363.
 Sewell, W. E., 445.
 Sewell, W. H., 288.
 Shafer, J., Jr., 814.
 Shafer, J. I., 607.
 Shahan, M. S., 243.
 Shands, H. L., 671.
 Shaner, M. L., 299.
 Shank, D. E., 882.
 Shankman, S., 14, 15, 618, 619.
 Shanor, L., 679.
 Sharp, D. G., 718.
 Sharp, P. F., 627.
 Shaw, F. R., 89.
 Shaw, H., 357, 528.
 Shaw, J. C., 239, 375, 384, 560, 854.
 Shaw, J. G., 537.
 Shaw, J. H., 130, 288, 420, 421.
 Shaw, W. M., 13.
 Shearer, G. D., 393.
 Shearing, T., 588.
 Shedd, C. K., 576.
 Shedlovsky, T., 763.
 Sheehy, E. J., 397.
 Sheets, L. W., 533.
 Sheets, O., 886.
 Sheets, O. A., 888.
 Shefrin, F., 756.
 Sheldon, W. H., 723.
 Shelton, F. V., 260.
 Shemin, D., 450, 761.
 Sheng, T. S., 104.
 Shepherd, G., 581.
 Shepherd, J. B., 381.
 Sheppard, P. A., 309.
 Sheppard, R. W., 687.
 Sherf, A., 758.
 Sherman, H. C., 410, 598, 599, 739.
 Sherman, M., 649.
 Sherman, M. S., 482.
 Sherrard, E. C., 22.
 Sherwin, H. S., 69.
 Sherwood, F. W., 742.
 Sherwood, R. M., 878, 858.
 Shield, J. A., 272.
 Shields, J. B., 740.
 Shier, G. R., 256.
 Shirck, F. H., 82.
 Shirky, S. B., 438, 439.
 Shirlaw, J. F., 242.

- Shirley, R. L., 301.
 Shive, J. W., 29.
 Sholes, M. L., 276.
 Shope, R. E., 562.
 Shorten, M., 220.
 Shrader, J. H., 552.
 Shrewsbury, C. L., 19, 91.
 Shuford, E. L., 42.
 Shuler, E. W., 143.
 Shull, S. C., 260, 582.
 Sibbitt, L. D., 199.
 Sideris, C. P., 507.
 Siegler, E. H., 77, 536.
 Sievers, F. J., 437.
 Siggers, P. V., 219.
 Sigurdsson, B., 893.
 Silber, R. H., 388, 601, 745.
 Silker, R. E., 17, 157.
 Silveira Guido, A., 688.
 Silver, E. A., 841.
 Silver, M. K., 591.
 Simerl, L. H., 579, 581.
 Simmonds, N. W., 650.
 Simmonds, P. M., 63.
 Simmons, C. F., 445.
 Simmons, E. L., 249.
 Simmons, P., 77.
 Simmons, S. W., 540.
 Simms, B. T., 445.
 Simms, H. S., 857.
 Simons, J. W., 724.
 Simonsen, D. H., 776.
 Simpson, D. M., 196, 806.
 Simpson, G. W., 690.
 Simpson, J. I., 281, 602.
 Simpson, M. E., 611.
 Simpson, R., 110.
 Sinclair, W. B., 10, 54, 154, 506.
 Singal, S. A., 136.
 Singleton, H. P., 91.
 Singleton, W. R., 38, 186, 649.
 Singleton, W. S., 455, 458, 460.
 Singsen, E. P., 549, 551.
 Sittel, C. W., 754.
 Sitterly, J. H., 410.
 Skau, E. L., 147, 161.
 Skeggs, H. R., 134, 276, 593.
 Skell, P. S., 463, 772.
 Skelley, W. C., 801.
 Skinner, C. E., 755.
 Skinner, J. J., 807.
 Skinner, J. T., 273, 871, 372, 373, 887.
 Skiver, F. M., 99.
 Skolko, A. J., 670.
 Slate, G. L., 817.
 Slater, A. E., 780.
 Slater, C. S., 170.
 Slesman, J. P., 66, 361, 690, 820.
 Slinger, S. J., 552.
 Slogteren, E. van, 74, 75, 208, 211, 514.
 Small, T., 67.
 Smallman, B. N., 85.
 Smelley, E. M., 755.
 Smiley, K. L., 774.
 Smith, A. K., 764, 769.
 Smith, A. L., 502.
 Smith, C. F., 691.
 Smith, C. L., 684, 833.
 Smith, C. N., 839.
 Smith, C. W., 111.
 Smith, D. C., 197.
 Smith, D. D., 722.
 Smith, E., 577.
 Smith, E. H., 144.
 Smith, F. F., 216, 690, 692.
 Smith, F. G., 147, 814, 819, 821, 896.
 Smith, F. H., 776.
 Smith, F. R., 126, 149.
 Smith, F. W., Jr., 634.
 Smith, G., 749.
 Smith, G. E., 272.
 Smith, G. M., 659, 749.
 Smith, H. R., 770.
 Smith, H. S., 536.
 Smith, H. V., 273, 629.
 Smith, J. A. B., 552, 557.
 Smith, J. C., 196.
 Smith, J. E., Jr., 205, 723, 754.
 Smith, J. M., 594.
 Smith, K. M., 71.
 Smith, L. E., 722.
 Smith, L. G., 703.
 Smith, L. T., 146.
 Smith, M., 139.
 Smith, M. C., 122, 131, 137, 273.
 Smith, M. G., 101.
 Smith, M. R., 221.
 Smith, N. R., 635.
 Smith, O., 660.
 Smith, O. F., 822.
 Smith, P. H., 445, 790.
 Smith, R. E., 910.
 Smith, R. J., 724.
 Smith, R. K., 585.
 Smith, R. M., 476.
 Smith, R. W., 360.
 Smith, S. E., 558, 841.
 Smith, S. G., 395.
 Smith, S. L., 272.
 Smith, T. J., 819.
 Smith, T. L., 119, 264, 874, 875.
 Smith, V. F., 843.
 Smith, V. T., 786.
 Smithcoors, J. F., 46.
 Smoyer, K. M., 346, 347.
 Smyth, C. P., 763.
 Smythe, V. R., 713.
 Snapp, O. I., 537.
 Snell, E. E., 157, 158.
 Snell, R. S., 805.
 Snider, H. J., 481.
 Snider, S. E., 21, 470.
 Snyder, G. B., 504.
 Snyder, J. C., 202, 203.
 Snyder, T. E., 888.
 Snyder, W. C., 512, 513, 516, 675, 691.
 Sobel, A. E., 18, 421, 624, 748.
 Sokolov, A. V., 36.
 Solomon, M. E., 539.
 Soloway, S. B., 305.
 Somers, G. F., 603.
 Sommer, A. L., 29.
 Soper, J. D., 682.
 Sorber, D. G., 418.
 Sorenson, C. J., 757.
 Soskin, S., 887.
 Sotola, J., 545.
 South, G. P., 583.
 Southam, C. M., 483.
 Southerland, F. L., 404.
 Spadaro, J. J., 769.
 Sparks, M., 466.
 Sparrow, F. K., 60, 797.
 Spaulding, I. A., 865.
 Spaulding, P., 668, 829.
 Speck, M. L., 713.
 Speck, R. M., 19, 453, 461.
 Spector, H., 741.
 Speirs, M., 742, 888, 895.
 Spelser, R., 302.
 Spelman, A. F., 277.
 Spencer, D. A., 42, 188, 325.
 Spencer, E. L., 674.
 Spencer, L., 730.
 Sperber, N., 769.
 Sperling, F. G., 244.
 Perry, O. E., 759.
 Spicer, S. S., 223.
 Spielman, A. A., 91, 382, 552.
 Ples, T. D., 559.
 Pindler, L. A., 387, 395, 718.
 Pinella, J. R., 589.
 Pitzer, R. R., 596, 800.
 Poerl, E., 59.
 Prague, G. F., 806.
 Prague, K. L., 134, 276.
 Prague, R., 335, 821.
 Prent, J. F. A., 245.
 Prince, H., 138.
 Prunt, A., Jr., 522.
 Purr, S. H., 667.
 Squibb, R. L., 543.
 Reeramamurthy, V. V., 412.
 Tabler, R. M., 387.
 Tacey, E. C., 28.
 Tackpole, M. R., 475.
 Tadel, R., 702.
 Tadtman, E. R., 878, 879.
 Taebler, A. E., 366.
 Tafseth, H. J., 104.
 Tage, H. H., 366, 838.
 Tahl, A. L., 877, 881.
 Tahler, L. M., 605.
 Tahler, N., 696.
 Tahly, G. L., 82.

- Stakman, E. C., 508, 511.
 Stamberg, O. E., 91, 411, 424, 470, 707, 708.
 Stammers, F. M. G., 581.
 Standen, J. H., 510.
 Standish, J., 836.
 Stanley, E. B., 90, 704.
 Stanley, W. M., 674, 761.
 Stanley, W. W., 78.
 Stansbury, M. F., 459.
 Stansbury, W. M., 546.
 Stanton, T. R., 511.
 Stare, F. J., 419.
 Stark, O. K., 313.
 Stark, R. H., 654.
 Stark, W. H., 313.
 Starkey, R. L., 25.
 Starling, T. M., 200.
 Starr, D. F., 84, 537.
 Starr, G. V., 880.
 Starr, M. P., 208.
 Staten, H. W., 754, 756, 757.
 Stauffer, V. D., 444.
 Stearns, L. A., 356, 684.
 Steavenson, H. A., 817.
 Stebbins, G. L., Jr., 648, 798.
 Steele, H. R., 602.
 Steenbjerg, F., 643.
 Steeves, T. A., 309.
 Stefaniak, J. J., 636, 792.
 Steggerda, F. R., 292.
 Stein, C. D., 247, 719.
 Stein, H. J., 375.
 Steinbauer, G. P., 201.
 Steinberg, R. A., 29, 213, 644.
 Steiner, E. T., 153.
 Steiner, G., 75.
 Steiner, H. M., 531.
 Steinhaus, E. A., 77.
 Steinkamp, R., 746.
 Steinmets, F. H., 198.
 Steinweden, J. B., 538.
 Stephens, D., 374.
 Stephens, D. F., 373.
 Stephens [Stevens], H. E., 217.
 Stephens, J. C., 798.
 Stephenson, E., 882.
 Stephenson, R. E., 173, 828.
 Stepp, J. M., 865.
 Sterling, C., 38.
 Stern, R. M., 623.
 Sterne, M., 715.
 Stetten, D., Jr., 129.
 Stenk, W. K., 779.
 [Stevens] Stephens, H. E., 217.
 Stevens, T. D., 109.
 Stevenson, F. J., 66, 825.
 Stevenson, J. A., 58, 835.
 Stevenson, T. M., 755.
 Stevenson, W. A., 533.
 Stevenson, W. G., 562, 717.
 Steward, F. C., 321.
 Stewart, A. P., Jr., 627.
 Stewart, C. L., 578.
 Stewart, C. P., 132.
 Stewart, D. W., 763.
 Stewart, E. H., 175.
 Stewart, F., 313.
 Stewart, F. C., 144.
 Stewart, G. F., 887.
 Stewart, W. D., 510.
 Steyaert, R. L., 493.
 Steyn, D. G., 715.
 Stice, E., 636.
 Stickel, L. F., 520.
 Stiebeling, H. K., 127, 141.
 Stiles, G. W., 860.
 Stiles, K. A., 527.
 Stiles, W., 37, 757.
 Stine, O. C., 579.
 Stirton, A. J., 454, 464.
 Stitt, R. E., 198.
 Stoa, T. E., 199, 200, 287, 328.
 Stoddart, L. A., 327, 373.
 Stoker, G. L., 664.
 Stokes, J. M., 445.
 Stokes, W. E., 193, 810.
 Stoltz, R. B., 714.
 Storer, T. I., 521.
 Stotz, E., 125, 147, 626, 880.
 Stout, E. E., 284.
 Stout, G. L., 819.
 Stout, W. B., 579.
 Stoutemyer, V. T., 49.
 Stovall, R. P., 507.
 Strachan, C. C., 603.
 Straka, R. P., 418.
 Strandtmann, R. W., 701.
 Straus, F. S., 911.
 Street, H. E., 321, 645.
 Street, H. R., 235.
 Strickland, A. G. R., 742.
 Strickland, W. B., 900.
 Stringer, A., 357.
 Stroganov, B., 59, 207.
 Stroman, G. N., 649.
 Strong, F. C., 72, 680.
 Strong, F. M., 193, 283.
 Strong, M. C., 72, 331.
 Struckmeyer, B. E., 795, 796.
 Stuart, H. C., 127.
 Stuart, N. W., 216.
 Stubbs, E. L., 244.
 Stubbs, T. H., 228.
 Stuckey, H. P., 436.
 Stuckey, I. H., 494.
 Stulberg, C. S., 395.
 Stumbo, C. R., 268.
 Stumpf, P. K., 634.
 Sturkie, P. D., 188, 653, 709, 803.
 Subramaniam, M. K., 41, 646.
 Sukhorukov, K., 59, 207.
 Sukhov, K. S., 210, 341.
 Sulkin, S. E., 719.
 Sullivan, B., 762.
 Sullivan, M. X., 301.
 Summers, E. M., 674.
 Sumner, H. C., 629.
 Sumner, J. B., 614, 767.
 Sun, V. G., 638.
 Sunderlin, G., 124.
 Sutherland, L., 869.
 Sutton, W. R., 746.
 Swaby, R. J., 553.
 Swain, M. L., 454.
 Swales, W. E., 251, 720.
 Swanback, T. R., 662, 670, 788.
 Swanburg, J., 881.
 Swanson, C. O., 307, 451, 609.
 Swanson, E. C., 306.
 Swanson, G., 522.
 Swanson, P., 898.
 Swanson, P. P., 886, 887, 897.
 Swarbrick, T., 51.
 Sweeney, O. R., 156.
 Sweeney, T. R., 223.
 Sweet, R. D., 330.
 Sweetma, H. L., 350, 362.
 Swern, D., 4, 294, 463.
 Swett, W. W., 238.
 Swickard, M. T., 876.
 Swift, C. E., 459.
 Swift, R. W., 446, 843.
 Swingle, R. U., 335.
 Swisher, E. M., 211.
 Swynnerton, R. J. M., 533.
 Sydenstricker, V. P., 136.
 Sylvester, E. P., 507.
 Szatrowski, Z., 579.
 Tabor, H., 284.
 Tack, P. I., 683, 744.
 Taft, C. E., 180.
 Taggart, J. G., 755.
 Taggart, W. G., 906.
 Tal, F. L., 209.
 Talbert, T. J., 202.
 Talbot, M., 355.
 Tallafarro, L. G., 249, 250.
 Tallafarro, W. H., 249, 250.
 Talley, E. A., 293.
 Tanabe, T., 496.
 Tanada, T., 203.
 Tanner, F. W., 269, 272.
 T'Ant, C.-H., 685.
 Tapley, W. T., 329.
 Taraskevich, L. M., 59.
 Tate, H. D., 83, 758.
 Tatum, E. L., 35, 615.
 Taurog, A., 771.
 Taylor, A. H., 138.
 Taylor, A. R., 718.
 Taylor, B. R., 374.
 Taylor, C. C., 873.
 Taylor, C. F., 58, 510.
 Taylor, R. E., 337.
 Taylor, R. H., 140.
 Taylor, W. P., 829.
 Teeter, H. M., 21, 463, 464.
 Telford, E. A., 666.
 Telford, H. S., 88.
 Teller, W. M., 874.
 Tener, R. F., 435.

- Tennent, D. M., 745.
 Teorell, T., 100.
 Tepley, L. J., 185.
 Terrence, J., 562.
 Terrill, C. E., 42, 325, 801.
 Tervet, I. W., 758.
 Tessier, H., 415.
 Thackrey, R. I., 912.
 Thaden, J. F., 118.
 Thayer, C. L., 504.
 Thayer, J. W., 656.
 Thaysen, A. C., 60.
 Thede, M., 387.
 Theodors, S., 393.
 Theophilus, D. R., 607.
 Thiel, C. C., 385.
 Thiessen, E. J., 125.
 Thimann, K. V., 761.
 Thirumalachar, M. J., 336, 509.
 Thirumalachar, M. T., 336.
 Thistle, M. W., 415.
 Thomas, B. H., 594.
 Thomas, H. Earl, 218, 347, 513.
 Thomas, H. L., 112, 501.
 Thomas, I., 670.
 Thomas, J. W., 552.
 Thomas, L., 247.
 Thomas, L. J., 351.
 Thomas, M. E., 758.
 Thomas, P. T., 649.
 Thomas, R. C., 634.
 Thomas, W. A., 84.
 Thomas, W. D., Jr., 212.
 Thomas, W. P., 444.
 Thompson, C. P., 373, 756.
 Thompson, C. R., 775.
 Thompson, E. C., 121.
 Thompson, H. H., 266, 413.
 Thompson, H. M., 749.
 Thompson, J. F., 151.
 Thompson, M. A., 201.
 Thompson, R. L., 108.
 Thompson, S. Y., 556, 557.
 Thompson, F. L., 579.
 Thomsen, H. P., 521.
 Thomson, F. N., 713.
 Thorndike, L., 30.
 Thorne, C. B., 166.
 Thorne, D. W., 312, 788, 789.
 Thorne, J. P., 784, 789.
 Thorne, R. S. W., 36, 37.
 Thornton, B., 829.
 Thornton, M. H., 465.
 Thorp, F., Jr., 103, 717.
 Thorp, J., 111.
 Threlkeld, W. L., 857.
 Throckmorton, R. I., 445, 805.
 Thurston, H. W., Jr., 510, 581.
 Tidmore, J. W., 27, 177, 191, 786.
 Tilley, F. W., 791.
 Timmermans, A. S., 74.
 Timonin, M. I., 223.
 Tiner, J. D., 221.
 Tinkham, E. R., 351.
 Tischler, R. G., 269, 270.
 Tinklin, G. L., 876.
 Tinley, J. M., 408.
 Tisdale, W. B., 339.
 Tittsler, R. P., 713.
 Titus, H. W., 95.
 Tobey, E. R., 201.
 Tobiska, J. W., 584.
 Tobler Bottini, H. D., 68.
 Todd, F. A., 24.
 Todd, F. E., 688.
 Todd, H. P., 911.
 Todd, S. S., 298, 455.
 Toenjes, W., 331.
 Toevs, J. L., 654.
 Tolley, H. R., 110.
 Tolstead, W. L., 638.
 Tomarelli, R. M., 743.
 Tome, G. A., 185.
 Tomhave, A. E., 858.
 Tomlinson, W. W., Jr., 518.
 Toole, E. H., 201.
 Torre, L. M., de la, 281.
 Torrie, J. H., 41.
 Toscani, V., 272.
 Tosic, J., 635.
 Totter, J. R., 748.
 Townsend, G. R., 58, 335, 336, 819.
 Townsend, J. F., 352.
 Tracy, P. H., 558.
 Traub, H. P., 777.
 Travis, B. V., 366, 368, 541.
 Treadwell, C. R., 738.
 Trefethen, J. M., 474.
 Trelease, R. D., 411.
 Trelease, S. K., 29.
 Treschow, C., 815.
 Tretsvet, J. O., 849.
 Triblebold, H. O., 5, 266, 299.
 Trim, A. R., 242.
 Trimmerger, G. W., 237.
 Trout, G. M., 99, 622, 851.
 Trullinger, R. W., 447.
 Trumble, H. C., 474.
 Truninger, E., 29.
 Tsiang, Y. S., 194, 494.
 Tuba, J., 602.
 Tufts, W. P., 910.
 Tukey, H. B., 50, 51, 320.
 Tuller, E. F., 767.
 Turer, J., 19, 457, 462, 464, 471.
 Turk, K. L., 552.
 Turk, R. D., 246.
 Turner, C. N., 575.
 Turner, C. W., 46, 372, 449.
 Turner, H. D., 22.
 Turner, N., 352, 688, 689.
 Turnipseed, G. F., 684.
 Turrel, F. M., 53.
 Tuthill, L. H., 571.
 Tyler, C., 708.
 Tyner, E. H., 658.
 Tysdal, H. M., 193, 804.
 Tytzel, A. A., 318.
 Tyzzer, E. E., 507.
 Udall, D. H., 855.
 Uddin, F., 479.
 Udiljak, M., 598.
 Uhvits, R., 488.
 Ullstrup, A. J., 65, 195.
 Ulrich, H. P., 312.
 Umbreit, W. W., 179, 634, 768, 769.
 Underbjerg, G. K., 288.
 Underhill, G. W., 685.
 Underkofler, L. A., 767.
 Upton, R. G., 358.
 Usinger, R. L., 288, 831.
 Utech, N. M., 674.
 Utter, M. F., 464.
 Uvarov, B. P., 780.
 Vail, G. E., 876.
 Vale, M. D., 293.
 Valencia, J. I., 648, 798.
 Valencia, R. M., 648, 798.
 Valgren, V. N., 406.
 Valteau, W. D., 214, 819.
 Van Atta, G. R., 459.
 Vandecaveye, S. C., 786.
 Van Deman, C. E., 758.
 Vander Brook, M. J., 248.
 Vanderford, H. B., 756, 786.
 Van Der Noot, G. W., 801.
 Vanderplank, F. L., 80.
 van der Plank, J. E., 503.
 van Dersal, W. R., 26.
 van der Walt, S. J., 715.
 Van Dine, D. L., 532.
 Van Duyn, F. O., 281, 602.
 Van Es, L., 565, 858.
 Van Fleet, D. S., 797.
 Van Horn, J. L., 729.
 Van Lanen, J. M., 684.
 Van Ness, G. B., 607.
 Vannote, H. G., 86.
 Vannote, R. L., 86.
 van Overbeek, J., 35.
 Van Poucke, R. F., 845.
 van Rensburg, S. W. J., 553.
 van Ricciardi, 87.
 Vansell, G. H., 370, 688.
 van Slogteren, E., 74, 75, 208, 211, 514.
 Van Slyke, D. D., 761.
 Van Someren, V. D., 248.
 Van Tassel, R., 108.
 Van Vlack, C. H., 110.
 van Wagtenonk, W. J., 592, 776.
 Vassel, B., 853.
 Vaughan, T. L., 875.
 Vaughn, R. H., 125.
 Vavich, M., 273.
 Vavich, M. G., 623, 742.
 Vayssiere, P., 80.
 Vazquez Calcerrada, P. B., 76.

- Veeraraghavan, N., 396.
 Veeerhoff, O., 577.
 Viehmeyer, F. J., 52.
 Veitch, F. P., Jr., 626.
 Vélez, I., 206.
 Velez, M., 76.
 Velu, H., 180, 636.
 Venkatesan, T. R., 491.
 Verbeek, W. A., 547.
 Vergara C., C., 315.
 Verner, L., 53.
 Vickery, H. B., 128, 766.
 Viel, G., 362.
 Vlennot-Bourgin, G., 217.
 Viets, F. G., Jr., 794.
 Vigfusson, H., 393.
 Villafane, A. G., 664.
 Vincent, A. E., 678.
 Vincent, E. L., 446.
 Vincent, J. M., 316.
 Vinogradova, N. M., 649.
 Vinton, C., 268.
 Virtanen, A. I., 34.
 Visser, S. S., 310, 475, 628.
 Visnyel, K., 890.
 Viswanathan, D. K., 700.
 Vittum, M. T., 446.
 Vitucci, J. C., 347.
 Vivino, A. E., 626.
 Vix, H. L. E., 147, 769.
 Vogel, H. A., 463.
 Volk, N. J., 27, 28, 175, 177, 191, 196, 786.
 Volkerding, C. C., 758.
 Volz, E. C., 205.
 von Oettingen, W. F., 223.
 Voris, L., 446.
 Vovk, A. M., 210, 341.
 Vul'f, E. V., 181.
 Waddell, E., 282.
 Wadleigh, C. H., 171.
 Wadley, F. M., 77.
 Wadsworth, H. I., 746.
 Wagner, D. L., 128.
 Wagner, E. D., 525.
 Wagner, J. R., 234, 283.
 Wagtendonk, W. J., van, 592, 776.
 Wahby, A. M., 393.
 Wain, R. L., 62.
 Walsbrot, S. W., 154.
 Walsman, H. A., 599.
 Waite, H., 111.
 Waite, W. C., 724.
 Wakeham, H., 21, 460.
 Waksman, S. A., 304, 780, 791.
 Walden, B. H., 607.
 Walden, D. C., 607.
 Waldron, L. R., 48, 180, 199.
 Waletzky, E., 387.
 Walker, E. H., 181.
 Walker, J. C., 216, 515, 821, 896.
 Walker, J. W., 561.
 Walker, L. S., 446.
 Walker, R. V. L., 562, 563.
 Walker, T. K., 635.
 Walker, W. P., 733, 868.
 Wall, M. E., 231, 772.
 Wall, N. J., 406.
 Wallace, A., 788.
 Wallace, B. A., 409.
 Wallace, C. R., 531.
 Wallace, J. M., 346.
 Wallace, P. P., 352.
 Wallace, T., 58.
 Waller, E. F., 103.
 Wallin, J. R., 62, 502, 510.
 Wallin, L. W., 867.
 Wallinga, M. H., 386.
 Walls, E. P., 891.
 Walster, H. L., 168.
 Walter, E. D., 3.
 Walter, H. E., 713.
 Walton, A. C., 351.
 Walton, R. R., 77, 684, 757.
 Wander, I. W., 51.
 Wanderstock, J. J., 842.
 Wang, Y. L., 18.
 Wann, F. B., 678.
 Wannop, A. R., 374.
 Wantland, W. W., 388.
 Ward, G. E., 163, 766.
 Ward, J. W., 388, 564, 715, 717.
 Ward, K. M., 677.
 Warner, R. C., 163, 763.
 Warner, R. M., 26.
 Warren, E. L., 895.
 Warren, S. W., 403.
 Warwick, B. L., 246, 325.
 Washburn, L. E., 704.
 Washburn, M. R., 790.
 Washko, F. V., 288.
 Washko, J. B., 47.
 Wasser, C. H., 231.
 Waterhouse, D. F., 529, 541.
 Waters, H. A., 698.
 Watkins, G. M., 502.
 Watkins, T. C., 693.
 Watrous, R. C., 206, 333.
 Watson, E. K., 595.
 Watson, G. M., 645.
 Watson, M. A., 70, 673.
 Watson, S. A., 772.
 Watt, B. K., 277.
 Wattle, E., 100.
 Watts, B. M., 120, 418.
 Waugh, F. V., 581.
 Weatherburn, M. W., 604.
 Weaver, E., 7.
 Weaver, H., 254.
 Weaver, J. E., 167, 182, 317, 501.
 Weaver, J. G., 742.
 Webb, J. E., 222.
 Webb, J. R., 658.
 Webber, H. J., 283.
 Weber, A. F., 855.
 Weber, C. R., 199.
 Weber, C. W., 713.
 Weber, G. C., 313.
 Weber, G. M., 584.
 Webster, O. J., 822.
 Weckel, K. G., 852.
 Weeks, M., 294.
 Wehr, E. E., 397, 398, 569.
 Wehrle, L. P., 686.
 Welant, E. A., 227.
 Welbel, R. O., 806.
 Welgel, C. A., 81.
 Welhe, H. D., 6.
 Well, J. W., 64.
 Welmer, J. L., 671.
 Weinman, C. J., 225.
 Weinreich, C. F., 99.
 Welrether, F. J., 102, 392.
 Weiss, F., 57, 58, 335, 819.
 Weiss, H. B., 351.
 Weiss, J., 606.
 Weisberger, A., 762.
 Welch, A. D., 134, 761.
 Welch, D. S., 331.
 Welch, E. V., 86.
 Welch, F. J., 579.
 Weldon, V., 160.
 Wellensiek, S. J., 185.
 Wellington, W. G., 685.
 Wellman, F. L., 819.
 Wellman, H. R., 579, 724, 873.
 Wellman, R. H., 509.
 Wells, H. R., 754.
 Wells, P. A., 462.
 Wellwood, R. W., 669, 818.
 Wene, G., 80.
 Wene, G. P., 690.
 Wentworth, C. K., 310.
 Wenzel, L. K., 400, 861.
 Werblin, H., 624.
 Werkman, C. H., 464, 473, 762.
 Werneck, F. L., 88.
 Werner, H. O., 282, 897.
 Wernimont, K., 666.
 Wertz, A. L., 265.
 Wertz, A. W., 240.
 West, B. G., 722.
 West, D. E., 244.
 West, E., 68, 819.
 West, M. G., 243.
 West, W., 763.
 Westcott, C., 74.
 Westcott, G. W., 579.
 Westerfeld, W. W., 600.
 Westerfeld, C., 854.
 Westerman, B. D., 280.
 Weston, W. A. R. Dillon, 387.
 Wetmore, R. H., 38, 493.
 Wexler, E., 540.
 Weybrew, J. A., 608.
 Weygang, C., 1.
 Whatley, J. A., Jr., 373.
 Wheatley, W., 8.
 Wheeler, D. H., 462.
 Wheeler, E. H., 687, 694, 834.

- Wheeler, E. J., 661.
 Wheeler, H. G., 140.
 Wheeler, S. S., 704.
 Wheeler, W. A., 447.
 Wheeling, L. C., 786.
 Whelton, R., 126, 417.
 Whetzel, H. H., 33.
 Whiffen, A. J., 646.
 Whistler, R. L., 15, 772.
 Whitaker, T. W., 815.
 Whitcomb, W., Jr., 369.
 Whitcombe, J., 880.
 White, A. G. C., 473.
 White, D. G., 26, 664, 798, 818.
 White, J. C., 790, 791.
 White, J. W., 866.
 White, J. W., Jr., 162.
 White, M. J. D., 41.
 White, N. H., 341, 513.
 White, R. G., 108.
 White, R. M., 503.
 White, R., Sr., 698.
 White, W. C., 357.
 White, W. H., 415, 416, 505.
 White, W. N., 570.
 White, W. S., 654.
 Whitehead, E. I., 789, 794.
 Whitehead, F. E., 537.
 Whitehead, H. R., 557.
 Whitehead, T., 47.
 Whitfield, F. G. Sarel, 531.
 Whiting, A. G., 319.
 Whitlock, J. H., 104, 564.
 Whitman, A. L., 634.
 Whitney, D. E., 280.
 Whitney, L. V., 525.
 Whitney, R. S., 444.
 Whitson, D., 95, 547.
 Whittaker, C. W., 632, 681.
 Whittaker, J., 415.
 Wiant, J. S., 344.
 Wickerham, L. J., 321.
 Wickware, A. B., 567.
 Wiebe, G. A., 656.
 Wiebe, R., 162, 165, 166.
 Wiederhold, E., 138.
 Wiegand, E. H., 883.
 Wiehl, D. G., 418, 419.
 Wiele, M. B., 611.
 Wilcke, H. L., 607.
 Wilcox, A., 250.
 Wilcox, E. B., 444, 746.
 Wilcox, L. V., 478.
 Wilcox, M. S., 123, 270.
 Wilcox, W. W., 726, 728.
 Wilcoxon, F., 684.
 Wilde, S. A., 520, 630.
 Wilder, R. M., 876.
 Wildman, S. G., 777.
 Wileman, R. H., 195.
 Wiley, A. J., 230.
 Wilgus, H. S., Jr., 157.
 Wilke, C. F., 521.
 Wilkenning, E. A., 758.
 Wilkins, W., 127.
 Will, G. F., 780.
 Wilcox, O. W., 27, 173.
 Willett, E. L., 564.
 Willham, O. W., 756.
 Williams, C. B., 169, 780.
 Williams, C. G., 758.
 Williams, D. E., 841.
 Williams, E. E., 106.
 Williams, H. H., 265, 738.
 Williams, I. L., 758.
 Williams, J. G., 419.
 Williams, K. T., 465, 466.
 Williams, N. E., 297.
 Williams, R. C., 468.
 Williams, R. F., 318.
 Williams, R. M., 501.
 Williams, R. M., Jr., 873.
 Williams, R. R., 893.
 Williams, S. W., 868.
 Williams, V. R., 159, 429.
 Williams, W., 445.
 Williamson, A., 277.
 Williamson, C. T., 86.
 Williamson, J., 687.
 Willis, R. J., 670.
 Willis, R. L., 816.
 Willison, R. S., 217.
 Willits, C. O., 154.
 Willman, J. P., 843, 855.
 Wilm, H. G., 628.
 Wilsie, C. P., 809.
 Wilson, A., 92.
 Wilson, A. D., 114.
 Wilson, C. P., 144.
 Wilson, D. R., 393.
 Wilson, E. E., 260, 508, 517.
 Wilson, F. H., 895.
 Wilson, G. S., 554.
 Wilson, H. F., 832.
 Wilson, J. B., 8.
 Wilson, J. D., 66, 343, 675, 690, 820.
 Wilson, J. K., 30, 793.
 Wilson, L. T., 374.
 Wilson, M. L., 734.
 Wilson, T. E., 760.
 Wilson, W. O., 499.
 Willster, G. H., 852.
 Winding, C. C., 767.
 Wing, D. T. E., 304.
 Wingard, S. A., 200.
 Winge, O., 44.
 Wingo, C. W., 833.
 Winnick, T., 625, 744.
 Winter, A., 716.
 Winter, J. D., 402, 589.
 Winterberg, S. H., 480, 781.
 Winters, H. F., 55.
 Winters, L. M., 188, 325, 800.
 Vintrobe, M. M., 104, 375.
 Wise, G. H., 103, 382.
 Wise, L. E., 802.
 Wisecup, C. B., 87, 366, 368, 540.
 Wiseman, H., 122, 181, 187.
 Wishart, G., 88.
 Wislocki, G. B., 497.
 Withrow, R. B., 319.
 Witkin, E. M., 651.
 Wittwer, S. H., 35, 225.
 Witz, R., 444.
 Wolberg, F. B., 91.
 Wolcott, G. N., 696, 837.
 Wolf, F. A., 647.
 Wolf, F. T., 315.
 Wolf, J. Z., 99, 557.
 Wolf, M. J., 645.
 Wolfe, H. R., 566.
 Wolfenbarger, D. O., 81, 208, 836, 840.
 Wolff, I. A., 4.
 Wolfrom, M. L., 301.
 Wolfson, F., 387.
 Wood, J. G., 184.
 Wood, S., 179.
 Woodbine, M., 389.
 Woodbury, L. A., 76.
 Woodcock, E. F., 493.
 Woodlaver, L. B., 299.
 Woodman, R. M., 487, 488.
 Woodmansee, C. W., 122, 266, 413, 895.
 Woodroof, J. G., 124, 126, 266, 269, 271, 413, 735, 880.
 Woodruff, H. B., 314, 636.
 Woods, M. W., 519, 646.
 Woodside, A. M., 225, 695.
 Woodson, H. W., 620.
 Woodward, C. F., 5, 6.
 Woodward, R., 124.
 Woodward, R. R., 375, 842, 845.
 Woodward, T. E., 381.
 Woodworth, C. M., 806.
 Wooley, J. C., 862.
 Woolley, D. W., 136, 138, 449, 591, 761, 762.
 Worden, A. N., 295, 553.
 Work, S. H., 912.
 Wreath, A. R., 300.
 Wright, F. B., 401.
 Wright, J. C., 117.
 Wright, J. W., 38.
 Wright, K. T., 579.
 Wright, L. D., 134, 276, 593.
 Wright, M., 538.
 Wright, M. L., 252.
 Wright, S. J., 444.
 Wurts, E., 429, 430.
 Wyckoff, R. W. G., 468.
 Wylie, K. H., 263, 384.
 Yakushkina, N. I., 35.
 Yanasawa, K., 734.
 Yanovsky, E., 293.
 Yarmolinsky, H., 598.
 Yarwood, C. E., 343, 670.
 Yates, P. L., 578.
 Yates, W. W., 86.
 Yeager, A. F., 665.
 Yeager, J. F., 85, 539.

- Yee, J. Y., 12, 145, 682.
Yeh, P. C., 57.
Yeoman, E. D., 558.
Yettaw, L. E., 366.
Yoder, L., 156.
Yoe, J. H., 152.
Yothers, M. A., 77.
Youmans, J. B., 746.
Young, C. M., 885.
Young, E. C., 579.
Young, G. A., 281.
Young, G. Y., 291.
Young, H. Y., 507.
Young, M. D., 228.
Young, P. A., 344.
Young, V. A., 759.
Young, V. H., 58.
Young, W. P., 115.
Younger, F. M., 424.
Yu, T. F., 337.
Yung, F. D., 111, 255, 259.
Zaglits, O., 724.
Zaki, O. A., 394.
Zaki, R., 394.
Zappe, M. P., 352.
Zarafonetis, C., 719.
Zaumeyer, W. J., 335.
Zechmeister, L., 615.
Zehngraff, P. J., 226.
Zelle, M. R., 497.
Zelomek, A. W., 864.
Zentmyer, G. A., 346, 347, 828.
Zhdanova, L. P., 319.
Zlalcita, L. P., Jr., 422.
Zill, L. P., 592.
Zimmerman, H. E., Jr., 387, 718.
Zink, E., 317, 501.
Zipf, W. H., 121.
ZoBell, C. E., 30.
Zschelle, F. P., 615.
Zuckerman, A., 250.
Zweig, J., 242.
Zwilling, E., 499.

INDEX OF SUBJECTS

NOTE.—The abbreviations "Ala.", "Conn.[New Haven]", "Mass.", etc., after entries refer to the publications of the respective State experiment stations; "Hawaii" and "P. R. U." to those of the experiment stations in Hawaii and Puerto Rico (University station); and "U. S. D. A." to those of this Department.

- A. L. 63, original British Army louse powder, 548.
- ANTU—
du Pont rodenticide, alphanaphthylthiourea, 350.
toxicity to chicks and pigs, 854.
use as poison for common Norway rat, instructions, 350.
- Abortion—
contagious—see also *Brucella abortus*.
control by vaccination in New Zealand, progress, 244.
equine infectious or epizootic, etiology, 719.
- Abutilon theophrasti*, Duvel buried seed experiment, final results, U. S. D. A. 201.
- Acalypha rhomboidea*, seed development, 797.
- Acaridae, order Acari, revision based on comparative morphological studies, I, taxonomic, 365.
- Acariscus masoni*, trombiculid mite, new host records, 522.
- Accidents, farm, avoidance, U.S.D.A. 724.
- Acenaphthene—
in combination with X-rays, effect on plant tissue, 207.
induction of mutation in phytopathogenic bacteria, 798.
- Acetic acid bacteria, characterization procedure, 635.
- Acetobacter*—
infection, III, strains of *A. acetosum* isolated from pitching yeast and beer, 635.
spp., capsule formation, 635.
suboxydans assay for *p*-aminobenzoic acid, modifications, 622.
- Acetone-benzene-water mixtures, analysis data for, 21.
- Acetonemia—see Ketosis.
- Acetyl groups, microdetermination in acetates of glycosides and sugars, 153.
- Acetyl phosphate, oxidation by *Micrococcus lysodeikticus*, 464.
- Acetylmethylcarbinol-water system, liquid-vapor equilibria, 767.
- 3-Acetylpyridine, nicotinic acid deficiency produced in mice by, 136.
- Acetyltryptophane, utilization by man, 593.
- Achondrioplasia, dominant, recurrent mutation, in cattle, 799.
- Acid inversion of sucrose, 610.
- Acids, fatty—see Fatty acids.
- Acipenser fulvescens*, in Lake Winnebago, (Wis.) 76.
- Acrostalagmus zeosporus* n. sp., parasitizing nematode, 75.
- Acrosternum hilare*—see Green stink bug.
- Acrylic esters, emulsion polymerization of, 140.
- Actinomyces scabies*, infection studies, 343.
- Actinomycete, Meredith's, *Fusarium oxysporum cubense* inhibited by, 60.
- Actinomycetes, origin, hypothesis, 31.
- Adhesives, tacky and remolstening, peanut protein hydrates as, 164.
- Adrenocorticotrophic hormone, effect of various reagents, 611.
- Adsorption analysis of colorless compounds, techniques, 155.
- Aedes*—
aegypti eggs, ovicidal value of chlorine, 368.
aegypti, feeding through animal membranes, 227.
amesti, larva and male, 698.
lepidus, vector of *Plasmodium gallinaceum*, 87.
new species from—
Netherlands New Guinea, 698.
New Guinea, 227.
Okinawa, 87.
tortilis, mosquito new to United States, 366.
- Aerobiology, relation to plant disease, 508.
DDT, non-volatile content, effect on house
- Aerosol(s)—
files, 840.
dispersed by liquefied gases, new formulations, 684.
formation, tests of pyrethrum and DDT against common malaria mosquito and housefly, 541.
heat-generated, for agricultural pests, preliminary studies, 78.
insecticidal—
containing DDT, accelerated aging test, 778.
for pea aphid control, II, 692.

Aerosol(s)—Continued

liquefied-gas—

dispenser for testing, 77.

evaluation, 78.

particle-size distribution, 684.

OT, use in preparation of microscopic mounts of fungi, 646.

thermal fog generator for large-scale application of DDT and other insecticides, 684.

thermol fogs, DDT, for clothes moths in wool storage warehouse, 697.

African coast fever—*see also* East coast fever.

Agar media, gas bubbles developing in, 30.

Agasphaerops nigra—*see* Lily weevil.

Agitator, centrifuge-tube, construction and operation, 149.

Agricultural—

crops—*see* Crop(s).education—*see* Education.

experiment stations—

of U.S.A., publications statistics (1945), U.S.D.A. 143.

report on (1945), U.S.D.A. 142.

extension—*see* Extension.

geography, Philippine Islands, graphic summary, U.S.D.A. 262.

perishables, air transport, U.S.D.A. 263.

policies, postwar, U.S.D.A. 110.

production—

index numbers (1945), Ohio 110.

postwar, U.S.D.A. 110.

research progress reports, U.S.D.A. 140.

products—

distribution, postwar, U.S.D.A. 110.

expanding uses, U.S.D.A. 140.

freezing, locker and home, Wash. 418.

production, prices, and income, index numbers, Ohio 872.

research by experiment stations, progress reports (1945), U.S.D.A. 142.

research, future of, U.S.D.A. 140.

Agricultural and Industrial Chemistry, Bureau of, report of Chief (1945), U.S.D.A. 140, 141.

Agricultural Finance Review, November 1945, U.S.D.A. 406.

Agricultural Research Administration, notes, 608.

Agricultural Research in 1944, farmer's guide, 444.

Agricultural Statistics, 1945, U.S.D.A. 585.

Agriculture—

American, production and welfare objectives, 724.

applications of climatology, 630.

crofting, practice in West Highlands and Islands, book, 444.

European, decline and recovery, World Wars I and II, U.S.D.A. 408.

Foreign, February-March 1946, U.S.D.A. 268.

in California, historical review, book, 910.

of China, climatic effects, 28.

Agriculture—Continued

Oklahoma, looking forward, Okla. 865.

postwar problems and programs in Nebraska, committee reports listed, Nebr. 110-111.

postwar readjustments in Massachusetts, Mass. 864.

price policy for promotion of income from farming, 581.

production, income, and costs in Arizona, Ariz. 111.

resources in West Virginia, conservation and use, 865.

Agriculture in the Americas, 1946, U.S.D.A. 606.

Agilus anxius—*see* Bronze birch borer.

Agronomy—

general, bibliography, 1940-44, 781.

research—

by experiment stations, progress reports (1945), U. S. D. A. 142.

progress reports, U. S. D. A. 140, Ala. 148.

Agropyron, *Elymus*, and *Sitanion* hybrids, artificial and natural, 648.*Agropyron* hybrids, artificial and natural, 798.*Agrostis* spp., aneuploids, morphological variations and occurrence in Rhode Island, 494.

Air, condensation levels in, comparison of lower-cloud bases with, 23.

Air transport of agricultural perishables, U.S.D.A. 263.

Aircraft, DDT dispersion from, 79.

Aircraft workers in southern California, nutritional status, I-IV, 418.

Airplane—

application of DDT for control of adult mosquitoes in open unwooded areas, 868.

dusting of orchards practical, 72.

spraying rice fields with DDT for mosquito larvae, 87.

Alabama College, notes, 445.

Alabama Station—

notes, 445.

report, 143.

d(—)-Alanine, vitamin B₆ replaced for micro-organisms by, 158.*Alaria taxidæ* n. sp. from badger and other mustelids, description, 522.Albumin, egg—*see* Egg albumin.*Alcaligenes radiobacter*, cause of galls on zinnia, 219.

Alcohol—

dehydrogenation, technique, 147.

from wheat, malt-evaluation for, 166.

metabolism, relation to production of thiamine deficiency, 600.

motor fuels, iron pentacarbonyl as anti-knock agent in, 165.

wood sugars fermented to, 162.

Alcohol-hydrocarbon mixtures, water solubility in, 166.

Alfalfa—

- carotene content—
 - chromatographic determination, 157.
 - correlated with leafhopper resistance, 198.
 - dehydrated, assay by simplified technique, 17.
 - carotene-destroying system, enzymic nature, 768.
 - caterpillar, migrations in central U. S. A., 80.
 - decreases in Black Belt with decreases in soil fertility, Miss. 786.
 - growing practices, Mo. 198.
 - immunity to pea aphid, temporary, U. S. D. A. 822.
 - insect pollinators in California, 535.
 - new varieties, wilt resistance, Minn. 501.
 - production in Kansas, Kans. 805.
 - rhizoctonia root canker development, effect of soil temperature, U. S. D. A. 822.
 - seed production—
 - effect of lygus bugs, and their control by burning, 224.
 - effect of tripping, soil moisture, plant spacing, and lodging, 804.
 - honeybee role, Mich. 89.
 - seed, setting and production, effects of pollination, lygus infestation, genotype, and plant size, Miss. 804.
 - seed, water absorption and germination, effect of osmotic pressure, 488.
 - tripping by insects, Utah 688.
- Algae, fresh-water, from Louisiana and Texas, 180.**
- Algae, pure cultures, preparation and maintenance, 687.**
- Alkaloids in cinchonas of Peru, U. S. D. A. 148.**
- Allegheny mound ant and control, 77.**
- Allium cepa—see also Onion(s).**
- cytological effects of sulfanilamide, 324.
- Alsophila pometaria—see Fall cankerworm.**
- Alternaria, Danish species, monograph, 60.**
- Aluminum dross, fertilizer value, 30.**
- Aluminum stearate, DDT penetration prevented by, 79.**
- Ambrosia artemisiifolia, Duvel buried seed experiment, final results, U.S.D.A. 201.**
- Amelanchier spp., American, monograph, 316.**
- American—**
- cockroach, arsenicals for, concentration-survival time relations, 85.
 - cockroach, nicotine penetration rates from solutions of various pH values, 77.
 - dog tick, vector of Rocky Mountain spotted fever, control, preliminary tests, 701.
- American Farm Economic Association, committee on parity concept, survey of economists' views, 724.**
- American Meteorological Society, recommendations on teaching meteorology, 308.**

American Phytopathological Society—

- annual meeting, 1946, abstracts of papers, 334.
 - New England Division, 1946 meeting, report, 819.
 - Potomac Division, third annual meeting, report, 820.
 - report on vegetable seed treatments in 1944, U.S.D.A. 674.
- American Society of Animal Production, index to Proceedings, 90.**
- American Society of Parasitologists, papers, abstracts, 351.**
- Amide synthesis in plants, amino-acid changes in germinating seedlings, 491.**
- Amino acid(s)—**
- administration to rats fed low protein diet, hemoglobin formation following, 593.
 - changes in germinating seedlings, 491.
 - deficiency, role in tongue deformity of chicks, 105.
 - effect on liver fat, 737.
 - in animal proteins, microbiological determination, 618.
 - microbiological assay, 14.
 - peptides, and proteins—
 - investigations, XXI, 618.
 - investigations, XXIII-XXV, 619.
 - protein contents, assay, 128.
 - Streptococcus faecalis* requirements, 179.
- α -Amino acids, reaction of ascorbic acid with, 626.**
- d -Amino acids—**
- utilization by man, 128.
 - III-IV, arginine and acetyltryptophane, 593.
 - V, histidine, 736.
- p -Aminobenzoic acid—**
- assay—
 - Acetobacter suboxydans*, modifications, 622.
 - Leuconostoc mesenteroides*, 622.
 - effect on growth of legume, 183.
- Ammonium—**
- molybdate, control of whiptail in cauliflower and broccoli crops in New Zealand, 512.
- nitrate—**
- and organic matter in fertilizer mixtures, 30.
 - preparation for use as fertilizer, U.S.D.A. 632.
 - properties of granular and monocrysaline, 145.
 - nutrition, influence on nitrogen metabolism, 794.
- Amorpha fruticosa*—see Indigobush.**
- Amphimallon majalis*, control in lawns, 696.**
- Amyla—**
- inhibitor—
 - cereals, distribution and general properties, 612.
 - wheat, mode of action, 613.
 - wheat, preparation and properties, 613.

Amylase—Continued

sorghum, composition and traces in malt, 613-614.

-Amylase in barley malt, determination, modification of Kneen and Sandstedt methods, 473.

β -Amylase in barley malt, determination, modification of Kneen and Sandstedt methods, 473.

Amylopectin, separation by nitroparaffins, 15.

Amylose, separation by nitroparaffins, 15.

Anacardiaceae, Chinese gallnuts on trees of, general study, 57.

Analysis, adsorption, of colorless compounds, technique, 155.

Ananas—

comosus, nitrogenous constituents, effect of potassium, 507.

sativus—see Pineapple(s).

Anastrepha ludens—see Mexican fruit fly.

serpentina, immature stages, development, relation to temperature, 537.

Anemia—

absorption and utilization of ferrous vs. ferric iron in, radioactive-isotope determination, 130.

equine infectious, in brood mares and their offspring, 719.

in monkey, studies, 600.

in rats, correction by iron compounds, 596.

infectious equine, acute, penicillin treatment, 247.

Anemometer(s)—

cup, errors in fluctuating winds, 309.

hot-wire, sensitive, calibration characteristics, 309.

slowage indicators, 474.

Anemone pulsatilla, antibiotic (protoanemonin) from, 180.

Anesthesia, influence on experimental western equine encephalomyelitis, 719.

Anesthetic for horses, newly developed, 386.

Aneuploids, morphological variations and occurrence in *Agrostis* spp. in Rhode Island, 494.

1,4-Anhydro-D,L-xylitol, designation, 294.

Animal(s)—see also Livestock; *specific kinds*.

blood groups and transfusion in, 100.

breeding, experiments in England, book, 652.

breeds, heterozygosity reduced by inbreeding, 187.

carnivorous, *Physaloptera*, annotated list, 88.

cobalt in, determination with nitrosocresol, 151.

colonies, genetic purity, 187.

communities in Medicine Bow Mountains, ecological reconnaissance, Nebr. 219.

cytology, book, 41.

diseases, research—

by experiment stations, progress reports (1945), U.S.D.A. 142.

progress reports, U.S.D.A. 99, Ala. 143.

Animal(s)—Continued

domestic—

brucellosis, control progress, 854.

DDT toxicity for, 86.

hereditary abnormalities, 853.

farm, tolerance to feed containing 2,4-dichlorophenoxyacetic acid, 558.

feed supplement, fused tricalcium phosphate fertilizer, 841.

feeding chemicals for pest control, 527.

husbandry, research—

by experiment stations, progress reports (1945), U.S.D.A. 142.

needs, U.S.D.A. 140.

progress reports, U.S.D.A. 90.

insect pests, DDT tests summarized, 85.

laboratory, DDT toxicity, 86.

measurement, new instrument, 708.

meat, production and consumption in war and peace, U.S.D.A. 260.

"1080" poisoning, clinical observations, 720.

production inheritance, evaluation method, N.Y. (Cornell) 798.

production, principles, book, 89.

range, selenium poisoning, pathology, Wyo. 559.

Salmonella infections, 242.

Animal Industry, Bureau of, report of Chief (1945), U.S.D.A. 41 140, 141.

Annatto, reactions and properties as cheese color, II, 557.

Anopheles—

albimanus, in Florida, 86.

culicifacies, bionomics, III, IV, 699.

fluvialis, behavior, IV, gravid females, 700.

mosquitoes of California, ability to transmit malarial of foreign origin, 228.

new species from Okinawa, 87.

punctulatus, complex 698.

quadrimaculatus—see also Common malaria mosquito.

laboratory rearing, 698.

spp.—

female, moonlight and house-haunting habits in West Africa, 367.

in brackish water on Pacific coast, 77.

in Brazil, 87.

in southern Michigan, Mich. 86.

Anopheline mosquito(es)—

Chagasia roseboomii, description, 228.

distribution in Solomon Islands, 228.

Indian, adult bionomics, with special reference to malaria control by pyrethrum, 698.

Anoxia, anoxic, resistance, effect of toco-pherol and fat, 739.

Anoxia, effects on ascorbic acid excretion, acidity of urine, and survival of rats, 427.

Ant(s)—

activity above ground, daily fluctuations of three species, 855.

collection, use of ether, 221.

host of fungus *Laboulbenia formicarum*, 221.

Ant(s)—Continued

new house-invading from Massachusetts, 855.

role in coincident infestations of soft and yellow scales, 77.

Anthelmintic, phenothiazine as, 101.

Anthonomus signatus — see Strawberry weevil.

Anthraxose on—

cannery tomatoes, control, two years' results, Mich. 677.

cucumbers, control by Fermate, 827.

on lespedeza, cause and symptoms, 671.

on snap beans, control by DDT dust, Mich. 360.

Anthrax—

in man, treatment by sulfadiazine, 242.

treatment with sulfadiazine, 242.

vaccine, avirulent, 715.

Antibacillin, naturally occurring inhibitor of bacillin, 814.

Antibacterial activity of protamine zinc insulin, 813.

Antibacterial pigment from *Fusarium javanicum*, 814.

Antibiotic(s)—

activity of extract of western red cedar heartwood, 483.

from *Aspergillus wentii*, effect on legume bacteria, 30.

from *Spiraea aruncus*, 483.

in Meredith's actinomycete, 60.

material from *Bacillus licheniformis* active against *Mycobacterium* spp., 313.

nature and action, review, 100.

production by fungi, 483.

research progress reports, U.S.D.A. 141.

substance—

assaying, agar-streak method, 304.

new, bacillin, from soil isolate of *Bacillus subtilis*, 314.

Antibody-antigen reactions, theory and corollaries, comparisons, 100.

Antigens—

cellular, individual differences between species hybrids, 190.

rapid, use against pullorum disease, 721.

segregation in bacterial culture by undescribed form of variation, 716.

Antigen-antibody reactions theory-corollaries—comparisons, 100.

Antilinositol effect of λ -hexachlorocyclohexane, 766.

Antioxidant(s)—

effect on linoleic acid autoxidation, N.Y. State, 147.

fat-soluble, estimation of total, 18.

for home-canned foods, 124.

d-isoascorbic acid as, 124.

Antiperspirant creams, action on fabrics, 899.

Antirachitic potency of irradiated ergosterol (D2) and 7-dehydrocholesterol (D3) for growing pigs, 376.

Antonoff's rule, so-called, note, 471.

Aonidiella citrina—see Yellow scale.

Apalocnemis, new species, Nearctic, with identification keys, 534.

Apanteles trifasciatus n. sp., description, 831.

Aphid(s)—

Chinese gallnuts caused, 57.

cucurbit resistance, test, 81.

host records, annotated list, 831.

influence on carbohydrate exchange in cotton, 359.

on Canada wildrice, 860.

Aphis middletonii, attack on squash roots, 77.

Aphonus castaneus in Connecticut, 352.

Aplodontia rufa, new mite, description, 369.

Aplomya caesar, parasitization of European corn borer, 83.

Apple(s)—

blossom insects, control by DDT, 225.

blossom structure and setting of varieties compared, 50.

boron deficiency, observations at New South Wales, 516.

Brooks' fruit spot, fungicidal control by new organics, 72.

cold storage design, 577.

damage by plum curculio, effect of temperatures, 352.

drops after frost, prevention by growth substances, 51.

fruit maturity as influenced by naphthalene-acetic acid, 50.

fruit rots caused by *Penicillium*, 217.

industry, changes in Maine, Maine 579.

juices, canned, examination, 269.

Macoun, fruit set under adverse weather conditions, 1945, 331.

McIntosh—

freezing, use of calcium salts, 271.

leaves, color standards, [N.Y.] Cornell 816.

mite, control when DDT is used, 225.

organoleptic tests, 735.

preharvest drop, influence of naphthalene-acetic acid method, 51.

preharvest drop retarded by naphthalene-acetic acid aerosols, 50.

production costs in Hood River Valley, Oreg. 113.

quality, effect on price and rate of sale, [N.Y.] Cornell 730.

scab—

control, 827.

control sprays and dusts, application, machinery, 827.

fungicidal control by new organics, 72.

ground treatments, N.Y. State 72.

self- and cross-pollination of varieties compared, 50.

sirup, by ion exchange process, 161.

tree pruning wounds, treatment and healing in sound and winter-injured trees, [N.Y.] Cornell 331.

varieties for western slope, Colo. 331.

vitamin C content, effect of ripening, storage and other handling methods, Iowa, 898.

- Apricot(s)**—
 dried, deterioration, influence of temperature, 879.
 dried, storage, gas changes and influence of oxygen on rate of deterioration, 879.
 dried stored, deterioration, influence of moisture and sulfur dioxide, 878.
 freezing in California, 881.
 leaf—
 injury from fluorine deposit, 517.
 scorch in Utah, Utah 678.
 oxidation, control, 883.
Aquilegia, cultivated and wild, taxonomic monograph, 34.
- Argentina**—
Boophilus australis control by gamma isomer of hexachlorocyclohexane, 700.
 cultivated plants, pest, *Ligyris burmetateri*, 687.
 sugar beet, yellow wilt, U.S.D.A. 826.
 Arginine, utilization by man, 593.
Arilus cristatus—see Wheel bug.
 Armillaria root rot, development, relation to soil temperature, Calif. 209.
 Arthropod pests of Cuba, 532.
Artocarpus integra, planting in Coconut Grove, Fla., 667.
 Aryl arsonic acids, effect on experimental coccidiosis infection in chickens, 567.
 Ascariasis in swine, 857.
Ascaridia galli, glycogen utilization, comparison in vitro and in vivo, 397.
 Ascarids of swine, removal, efficacy of sodium fluoride, 718.
Ascaris lumbricoides var. *suis*, penetration of hexyl resorcinol, effect of surface substances, 242.
Asclepias syriaca pods, types found in Michigan, U.S.D.A. 797.
 Ascomycetes, growth and fruiting, influence of carbohydrate in medium, 644.
- Ascorbic acid**—see also Vitamin C.
 antioxidants for home-canned foods, 124.
 concentration of Florida grapefruit, seasonal changes, 283.
 content of—
 blood serum, determination, 626.
 cabbage, availability in college women, Iowa 897.
 cabbage, relation to environment and heredity, 896.
 cabbage salads, 602.
 cantaloup, effect of storage, Del. 895.
 cauliflower, effect of steam and hot-water blanching, 281.
 chile, effects of canning and drying, N. Mex. 889.
 citrus juices, retention, 138.
 dehydrated green beans, effect of blanching, storage, and cooking, 276.
 food served in cooperative residence hall for women, 895.
 fresh green peas, determination, 623.
 freshly harvested vegetables, 602.
 grapefruit juice, effect of commercial canning and short-time storage, 283.
- Ascorbic acid**—Continued
 content of—continued
 kale, effect of storage, Del. 895.
 lima beans, frozen and canned, effect of home cooking, 746.
 mango, relation to variety, 747.
 potatoes, factors affecting, Nebr. 897.
 potatoes, influence of variety, environment, maturity, and storage, 897.
 sauerkraut, effect of processing and storage, 897.
 snap beans, effect of steam and hot-water blanching, 281.
 strawberries, varietal differences, La. 899.
 summer squashes, 277.
 sweetpotatoes, and storage losses, Ariz. 131.
 sweetpotatoes, effect of curing, S.C. 891.
 sweetpotatoes, effect of fertilizers, curing, storage, and cooking, Ga. and N.C. 742.
 tangerines and factors influencing, Ariz. 187.
 tomato varieties and retention in processed products, 603.
 tomatoes at cannery, determination by field illumination and handling, 603.
 tomatoes canned by five home-processing methods, La. 898.
 tomatoes canned in home, 898.
 vegetables, effects of icing, 895.
 deficiencies, acute and chronic, in rhesus monkey, 283.
 dye titration, specificity, 602.
 excretion by sweat and urine under different environmental conditions, 740.
 excretion, effect of food intake and anoxia, 427.
 extra-dietary, effect of copper, 426.
 ice cream as source, 131.
 indophenol-xylene extraction method, and modifications for interfering substances, 626.
 losses in large-scale cooking, Ala. 131.
 oxidase, dietary, effect, 426.
 oxidizing agent in doughs, 297.
 prevention of browning in peaches, Ga. 735.
 retention in marmalade during preparation and storage, 432.
- L-Ascorbic acid**, fatty acid monoesters in fats and oils, assay, 19.
- Ash lace bug, *Leptotypha minor*, biology and control, 831.
- Asparagus**—
 harvesting by field-snapping method, Mich. 49.
 seedling blight, N.J. 215.
 stem tips, excised, culture in vitro, further experiments, 488.
 wilt and foot rot, cause, 334.
- aspergillus**—
flavus-oryzae, sterol production, with antirachitic potency, 480.

Aspergillus—Continued

niger, growth, specificity of potassium and magnesium, 644.

terreus, itaconic acid production by, 163.
wentii, antibiotics from, effect on legume bacteria, 80.

Association of Land Grant Colleges and Universities, notes, 288, 912.

Aster—

China, wilt, investigations, 217.

Yellows—

identification with kok-saghyz yellows and relation to big bud in tomato, 210.

nonspecific transmission by leafhoppers, Calif. 363.

phlebotid leafhopper vectors, Calif. 363.

Atmosphere—

lower, relations with solar activity, 473.
pollution by heavy industry, meteorological control, 780.

Atmospheric pressure upon insects, effects of variations, 685.

Atricholaelaps sigmodont n. sp., mite on cotton rat, with notes on *Atricholaelaps* and *Ischnolaelaps*, 701.

Auger, soil, general purpose, Colo. 722.

Aujeszky's disease in Wisconsin, 715.

Australia—

climatology, agricultural, 474.
grasshoppers and locusts, 686.

Austroletes cruciata eggs, parasite, *Scelio chortocetes*, diapause, 533.

Automobiles, digester gas, 109.

Automotive engines, nonpetroleum fuels, 108.

Auxin-protein complexes of wheat grain, 485.

Avena spp., interspecific cross, inheritance of rust reactions, etc., 41.

Avocado fruit, respiration, effect of oxygen concentration, 666.

Avocado, virus disease, U.S.D.A. 58.

Azine genus, Trematoda, Monogenea, note, 387.

Azalea, petal blight, control, 74.

Azaleas, imported, leaf and twig blight, investigations, 217.

Azobenzene—

efficacy in control of red spider mite on roses, N.Y. State and Cornell 356.
use as acaricide and insecticide, 528.

Azotobacter, respiration, as influenced by substrate, 179.

Bacillin, inhibitor, naturally occurring, antibacillin, 314.

Bacillin, new antibiotic substance from soil isolate of *Bacillus subtilis*, 314.

Bacillus—

brevis, tyrothricin from, 148.

cereus—

nuclear material, 178.

penicillinase from, 32.

sporulation process, 178.

licheniformis, antibiotic material active against *Mycobacterium* spp., 313.

Bacillus—Continued

licheniformis, formation of carbon dioxide, and cultural method of detection, 553.

polymyxa, occurrence in Alberta soils, 339.

subtilis, antibiotic production, I, II, action and toxicity, 636.

subtilis, soil isolate, bacillin, new antibiotic substance, 314.

Bacon, overseas, preparation, retention of thiamine, riboflavin, and nicotinic acid, 279.

Bacon, processing, retention of thiamine, riboflavin, and niacin, 428.

Bacteria—

aerobic mesophilic sporeforming, U.S.D.A. 635.

causing leaf and pod spots of snap and lima beans, overwintering in soil, 827.

cellulose-decomposing thermophilic culture, characteristics, 31.

coliform, chloramine effects as influenced by pH and temperature, 100.

diphtheroid, in bovine infectious pyelonephritis, 103.

distance dispersion rates, 208.

electrophoretic mobilities, influence of surface-active agents, 177.

enteric pathogenic, chloramine effects of pH and temperature, 100.

entomogenous, competition, 221.

growth rate, determination, simple photometric method, 313.

identification by means of bacteriophage, Ohio 634.

lactic acid, pyridoxine function, 179.

milk, reaction to—

penicillin, 852.

streptomycin, 852.

nuclear material, 178.

phytopathogenic, mutation due to acenaphthene, 798.

phytopathogenic, nutrition, 208.

sporulation process, 178.

stale-medium effects, 32.

sterilization methods, 99.

sucrose synthesis and utilization, mechanism and significance, 31.

sulfate-reducing, dyes inhibiting, practical applications, 32.

surfaces, electrokinetic studies, 177.

Bacterial—

black chaff of wheat, diagnosis, 213.

blight of sugar beet, seed transmission, 673.

canker of stone fruit, 678.

cell, cytoplasmic membrane, morphology, nature, and functions, 81.

cultures, development, microcalorimetric study, 640.

galls of plants, and causal agents comparisons, 59.

growth in butter, effect of salt distribution, Iowa 95.

infections in rats, defense mechanisms, relationship to diet, 559.

Bacterial—Continued

- infections, newer drugs, 853.
- spoilage of canned meats, prevention by thermal processing, 268.
- wilt, resistance of new alfalfa varieties, Minn. 501.
- Bactericidal activity of sodium hydroxide, influence of changes in concentration, 791.
- Bactericides, chloramine vs. chlorine, 100.
- Bactericides, for dairy industry, 99.
- Bacterin, autogenous, treatment of *Pasteurella multocida* infection in wild ducks, 398.
- Bacteriologist, great, Sergei Nikolaevitch Winogradsky, Sept. 1, 1856–Aug. 31, 1946, 780.
- Bacteriology—
 - dairy, papers, abstracts, 713.
 - elementary, textbooks, 633.
 - marine, book, 30.
 - papers, 634.
- Bacteriophage—
 - means of identifying bacteria, Ohio, 634.
 - nature, 483.
 - studies with cheese, 557.
- Bacteriostatic factor, in tomato fruits, 33.
- Bacterium coli*, phenol reaction with, temperature coefficient by new technique, 101.
- Bacterium translucens*, black pigment, tyrosinase factor, 63.
- Badger, fluke, new species, description, 522.
- Baeria chrysotoma*, cultivation under sterile conditions, preliminary study, 640.
- Bahia grass types, 805.
- Bait(s)—
 - mixtures, poisonous, calculation, 521.
 - poison, use in locust campaign, 533.
 - rat, evaluation by field acceptance trials on Guam, 521.
- Bakelite varnish for honey extracting equipment, 702.
- Baking—
 - freezing batters and doughs before, 124.
 - ingredients, varietal responses in evaluation of protein quality of wheats, 306.
 - quality of wheat, weight and protein-content relation, 48.
- Bamboo(s)—
 - control of, soil erosion, 26.
 - leaf spot, caused by *Olliochorella bambusarum* n. sp., 679.
 - of China, new species and variety, 34.
- Bambusa tuldoidea*, curing relation to durability, U.S.D.A. 818.
- Banana leaf speckle in Jamaica, 519.
- Bang's disease—see Brucellosis.
- Bankhead-Jones Farm Tenant Act, farm ownership, financing under, La. 116.
- Barberry, destruction for cereal rust control, 63.
- Bark beetles, southern pine, informatory account, 84.
- Barley—
 - Bay, new variety, Mich. 656.
 - blights affecting production, 336.

Barley—Continued

- cross, inheritance of stem rust reaction, nitrogen content of grain, and kernel weight, 648.
- cultivated, pollen tube, course, 805.
- eyespot in Scotland in 1944, 671.
- germinated, analyses, effects of variety and environment, 290.
- helminthosporium foot rot, 334.
- leaf rust, effect on quality and yield, 63.
- loose smut—
 - fungi in embryos, detection, 63.
 - incidence in West Virginia, seasonal, U.S.D.A. 58.
- malt, amylase content, determination, modified methods, 473.
- production in Nebraska, 822.
- production, leadership of North Dakota, N. Dak. 828.
- root-absorption of radioactive rubidium and phosphorus in, 36.
- seedling, nitrogen metabolism, aspects, relation of early growth to, 316.
- seed and seedling infection by *Xanthomonas translucens* var. *cerealis*, 510.
- varieties—
 - grown in U.S. and Canada in 1945, classification, U.S.D.A. 656.
 - performance tests (1945), N.C. 192.
 - reaction to wheat stem sawfly attack, 688.
 - spring, response to floral loose smut inoculation, 671.
 - winter, growing in New Jersey, N.J. 805.
- Barn(s)—
 - cleaners, types, aid to mechanization, Wis. 401.
 - dairy, insect control with DDT, 366.
 - milking, walk-in type, 578.
- Base exchange, in silicates, 145.
- Bast fibers, structure, properties, and preparation, 663.
- Batters, pastry, freezing before baking, 124.
- Bean(s)—
 - blackeye, in California, Calif. 502.
 - broad, powdery mildew caused by *Erysiphe polygoni* in Yunnan, China, 337.
 - castor. See Castor-bean.
 - diseases in Intermountain States, 1945, 335.
 - frozen green, vitamin retention in quantity food service, 889.
 - green, dehydrated, processing, effects on calcium, phosphorus, and ascorbic acid contents, 276.
- lima—
 - ascorbic acid content of frozen and canned, effect of home cooking practices, 746.
 - bush, promise, N.Y. State and Cornell 829.
 - Lygus* bug injury in California, 675.
 - seed pitting by *Lygus* bugs in California, 691.
 - spots, leaf and pod, bacteria causing, overwintering in soil, 827.

- Bean(s)**—Continued
 Lima—continued
 vitamin studies, 888.
 vitamin B₁, preservation, Miss. 743.
 mosaic, new, in Idaho, Idaho 210.
 mosaic virus, common, association with *Xanthomonas phaseoli*, II, III, 823.
 mung—see Mung beans.
 plants, histological responses to phenyl-acetic acid, 319.
 plants, respiration, solid matter, and water relations, effect of 2, 4-dichloro-phenoxyacetic acid, 820.
 red kidney seed, special problems, N.Y. State and Cornell 329.
 resistance to—
 anthracnose, 512.
 mosaic, 512.
 weevil attack, 512.
 sclerotinia rot disease in Idaho, 335.
 snap—
 ascorbic acid content, effect of steam and hot-water blanching, 281.
 dusting for control of anthracnose and leafhoppers, year's results, Mich. 360.
 freezing, rate, effect on appearance, palatability, and vitamin content, 880.
 growing, costs, returns, and practices, on Cumberland Plateau, 1944, Tenn. 404.
 nutritive value, 423.
 spots, leaf and pod, bacteria causing, overwintering in soil, 827.
 vitamins as influenced by home freezing and cooking, 132.
 string, canning, bud, blossom, and pod drop reduction by plant hormones, 675.
 varieties, selection by beet leafhopper, and relation to curly top, 833.
 virosis in Montana, 334.
 yields, effect of calcic and magnesic diluents of calcium arsenate, 689.
- Bed bugs**—
 exposed to DDT, effect of temperature, 227.
 resistance to DDT, biological factors, 365.
- Bee(s)**—see also Honeybees.
 diseases, incidence and distribution in Britain, 89.
 feeding for comb production, 369.
 legume seed-production role, Mich. 88.
 movement in edge of cluster, 89.
 pollen substitute, supplying by dry feeder, Ohio 369.
 protection from DDT, N.C. 702.
 queen, life, book, 369.
 queen, performance, 701.
 repellents, materials for, 89.
 saving, practical account, Colo. 702.
 secretion of wax, 369.
 winter cluster temperature, 89.
- Beech**, European, leaves, morphology and water economy, modifications caused by frost during foliation, 347.
- Beech**, susceptibility to drought and adverse winter conditions, 668.
- Beef**—
 canning, Ga. 269.
 freezing temperature, relation to histological characteristics, tenderness, and drip losses, 271.
 histological characteristics, tenderness, and drip losses, relation to freezing temperature, 271.
 muscle meat, protein value, comparison with buffalo and goat, 275.
- Beekeeping and diseases**, research progress reports, U.S.D.A. 141.
- Beer**—
 "percentage concentration," conversion to gallonage, 166.
 vitamins added, stability, 424.
- Beet(s)**—
 carrion beetle infestation in Switzerland, 359.
 frozen—
 decay, 184.
 fructosan-synthesis mechanism in, 184.
 viscous rot, causal organism, *Phytomonas betae-gelatae* n. sp., description, 673.
 leafhopper, ability to regain lost vitality by transfer from unfavorable to favorable host plants, 359.
 leafhopper, selection of bean varieties, and relation to curly top, 833.
 molasses, cattle fattening by, Wash. 91.
 mosaic, aphids as vectors, 70.
 nematode, soil populations as influenced by cropping, 70.
 sidedressing with salt, results, N.Y. State and Cornell 814.
 yellows, aphids as vectors, 70.
- Beetles**, in stored products, monograph, 85.
Begonia semperflorens, inheritance in, 40.
- Benzene hexachloride**—
 for control of cotton insects, 535.
 in grasshopper baits, 686.
 house fly larval control by, 77.
 significance in agriculture, 528.
 ("666")—
 insect control in canning industry, 85.
 preliminary experiments, 223.
- Benzene-acetone-water mixtures**, analysis, data, 21.
- Benzenes**, α -trichloromethyl-substituted, in codling moth larval control, 77.
- Benzoyl-d-(—)-alanine**, unreactivity toward formaldehyde, and methylene bridges, 764.
- Betacocci**, production of diacetyl in milk, effect of rancidity, 554.
- Betaine**, isolation from guayule, 8.
- Bibliography of**—
Anopheles darlingi as malaria vector, 87.
 antibiotics, nature and action, 100.
 bacterial plant galls, comparisons of causal agents and, 59.
 beetles in stored products, 85.
 colchicine research, 185.

Bibliography—Continued

- fertilizer use and crop yields, U.S.D.A. 790.
 fungicidal action of copper, 62.
 growth substances in plant diseases and causal agents, 59.
 physiologic specialization in plant-pathogenic fungi, 60.
 plant disease introduction prevention, 58.
 plant respiration, 37.
 potato in health and disease, 47.
 Puerto Rican literature, 1493–1930, P.R.U. 757.
 respiration in plants, 37.
 root diseases of fruit trees, 72.
 soil science, fertilizers, and general agronomy, 1940–44, 781.
 tobacco marketing and manufacturing margins, U.S.D.A. 115.
 tulip virus, diseases, 75.
 virus infection and reproduction, 58.
Xanthomonas translucens parasitism on Gramineae, 62.
 Blg bud, in tomato, relation to yellows of kok-saghyz and aster, 210.
 Bimonthly Bulletin, March–April 1946, N. Dak. 444.
 Bindweed, eradication by controlled grazing, Minn. 505.
 Bindweed, field, variations in, 49.
 Bins, turnip, storage with force ventilation, progress report, Ohio 862.
 Biochemical research, currents, treatise, 761.
 Biochemistry, subjects related to enzymology, advances, VI, 762.
 Bioclimatics, of insect life, 169.
 Biological—
 assays, confidence limits, 757.
 materials—
 citric acid assay in, 14.
 cobalt in, determination with nitroresol, 151.
 pyridoxal contents, 158.
 pyridoxamine contents, 158.
 Biotin—
 assay, *Lactobacillus arabinosus*, growth stimulants, 429.
 assay, microbiological, growth stimulants, 429.
 biological activity of related compounds and, 134.
 biosynthesis, desthiobiotin, 615.
 content in dairy products, microbiological assay, 20.
 deficiency, egg-white induced in rats, aggravation failure of succinylsulfathiazole, 429.
 deficiency syndrome in pigs fed desiccated egg white, 377.
 human, metabolism on various levels of biotin intake, 744.
 microbiological assay, stimulants for, 159.
 synthetic (and related forms), activity for chick, 134.
 2, 2'-Bipyridine, iron inactivation and effect on riboflavin synthesis by *Olostridium*, 81.
 Bird(s)—see also specific kinds.
 banding activities in Indiana (1941–44), 76.
 building in shrubs, nesting heights, 350.
 domesticated, flagellates, I, behavior of *Trichomonas gallinarum* in culture, 722.
 eastern, field book, 683.
 Elateridae eaten in Utah, 77.
 fall (1945) migration notes for U.S.A., 75.
 galliform and passeriform, gapeworm infection in New York State, 369.
 helminth parasites in western Massachusetts, 830.
 lice of rodents, descriptions, 88.
 migration, trans-Gulf, evidence, 522.
 of beech-maple-hemlock community, breeding, 829.
 racial variation, significance to wildlife management, 522.
 summer, of Okoboji region, 1938–42, 523.
Bironella hollandi, distribution in Solomon Islands, 228.
 Biscuits, making for canning, 416.
 Biscuits, ration, II–III, keeping quality, factors, 416.
 Blackberry leaf mite, loganberry dry-berry disease role, 77.
 Blackbird, species, study, 221.
 Blackflies, larvicidal control by DDT, 88.
 Blackhead disease of turkeys, control by phenothiazine, limitations, 569.
 Blanching—
 by electronics, new principles, 272.
 effect on ascorbic acid content of snap beans and cauliflower, 281.
 of fruits, by steam vs. sulfur, 126.
 of vegetables, electronic method, 125.
 Blankets, fiber content and care, effect on resiliency, thickness, and thermal conductivity, 750.
 Blast furnace slags, neutralization value, titration, 13.
Blatta orientalis—see Oriental cockroach.
 Bleeding, aseptic, of animals, method, 387.
Blissus leucopterus—see Chinch bug.
 Blood—
 constituents, changes in diseases of ruminants, 560.
 groups in veterinary practice, 100.
 of cows, contents under various physiological conditions, 383.
 Plasma—
 carotene and vitamin A forms, 132.
 iodine, determination, 771.
 of dogs, determination of free leucine, isoleucine, valine, and threonine, 618.
 proteins, changes produced by heat in presence of sugars, electrophoretic analysis, 765.
 tocopherols, determination, simplified hydrogenation technique, 627.

Blood—Continued

- serum—
 - albumin, tyrosine iodination, 3.
 - ascorbic acid content, determination, 626.
 - changes produced by heat in presence of sugars, electrophoretic analysis, 765.
 - transfusion in veterinary practice, 100.
 - tryptophan, microbiological assay, 15.
- Blossom midge, identity and host plants in Hawaii, 831.
- Blowflies, physiology and toxicology, studies, X, XI, 541.
- Blueberry (ies)—
 - cultivated—
 - insects, 84.
 - soil-reaction effects on growth and production, 53.
 - survey of industry in New Jersey (1944), 53.
 - dusting for control of cranberry fruit-worm, 836.
 - frozen, home processing and use, 882.
 - plant, diseased, eradication, 518.
 - stunt disease, insect carriers, 518.
- Bluegill, scale dimensions, means of calculation of fish conditions, 350.
- Bluegrass—
 - Kentucky, morphological variation in relation to breeding behavior, 197.
 - pastures, yield, estimation by clipping vs. grazing of dairy heifers, 850.
 - terrace outlet channel design, 722.
- Bluestem grass, utilization in maintenance of commercial cow herd, progress report, 873.
- Boars, *Brucella suis* isolation from semen, 717.
- Bodega Cooperative Creamery Incorporated, reorganization, proposals, Calif. 408.
- Body, human—see Human body.
- Boehmeria nivea*—see Ramie.
- Bone—
 - carbonate, relation to composition of blood and diet of rat, 421.
 - composition, relation to blood and diet of rat, 421.
 - development, need for manganese in rat, 421.
 - fluorine content, assay, 19.
 - growth in pigeons, X-ray effects, 47.
- Book(s) on—
 - agricultural development of Middle East, 911.
 - agriculture in California, 910.
 - animal cytology and evolution, 41.
 - animal production, principles, 89.
 - artificial insemination of Merino sheep, 187.
 - biochemical research developments, 761.
 - bovine trichomoniasis, 245.
 - Brazil, people and institutions, 119.
 - broiler production, 93.
 - carbohydrate metabolism in humans, 887.
 - chemistry of food and nutrition, seventh ed., 410.

Book(s) on—Continued

- chromosome atlas of cultivated plants, 648.
- climatology for advanced students, 474.
- crofting agriculture, practice in West Highlands and Islands, 444.
- Danish species of *Alternaria* and *Stemphylium*, 60.
- drug plants of Mexico, 181.
- dyes employed in biological laboratory, 778.
- eastern birds, 683.
- egg production, battery, practical guide, 706.
- elementary bacteriology, 633.
- entomological nomenclature and literature, 532.
- farm buildings, 862.
- farm mechanics, 722.
- food and nutrition for young people, 418.
- forset soils and forest growth, 630.
- fungicides and their action, 61.
- geology (rocks and rivers), 143.
- Glossina* spp. of French West Africa, 700.
- hardwoods of South, 507.
- herbal of Rufinus, reprinting of 13th century manuscript, 30.
- home economics, omnibus, 410.
- house building, 724.
- household refrigeration, 724.
- leaf analysis as basis for determination of fertilizer needs of soil, 321.
- marine microbiology, 30.
- mechanic's handbook, 108.
- meterology, dynamic, 308.
- microscope technique, 11.
- milk, condensed and powdered, 558.
- milk, secretion, 383.
- mineral resources, 143.
- nutrition and chemical growth in childhood, 274.
- onion production, 815.
- organic chemical syntheses, 1.
- pigeons, 711.
- plant immigrants and stowaways, 637.
- plants of Hawaii National Park illustrative of plants and customs of South Seas, 315.
- potato in health and disease, 47.
- poultry production, 234.
- practical cookery and etiquette of serving table, 267.
- protozoology, 77.
- queen bee, life, 369.
- rocks and rivers, 143.
- rural social organizations in U. S., Latin America, and Germany, 409.
- sewing fabric furnishings for home, 435.
- sex hormones, biological action, 188.
- slatted floor barn hay driers, 862.
- soil conservation, 26.
- soils and soil management, 24.
- spermatophytes of Dominican Republic, 181.
- trace elements, 29.
- turkeys, 380.

- Book(s) on**—Continued
 veterinary toxicology, Lander's, 386.
- Boophilus australis*, control by gamma isomer of hexachlorocyclohexane in Argentina, 700.
- Borax fertilizer for tobacco, Conn. [New Haven] 662.
- Boric acid, titration in presence of mannitol, 300.
- Boron**—
 compounds, solubility in plants, 184.
 concentrations, effects on development of *Taraxacum kok-saghyz* in sand cultures, 491.
 deficiency in—
 applies, observation at New South Wales, 516.
 pears, symptoms and control, 678.
 plant-nutrient value and interrelationships, 29.
 requirement of plants, relation to photoperiod, 796.
 role in tobacco fertilization, 788.
 supplements, response in rats fed rations low in potassium, 273.
- Bos indicus*, roughage digestibility, crude fiber effects in cattle vs., 91.
- Botrytis cinerea*, damage to lemons, and control, 346.
- Botrytis*—
 disease in California, 335.
gladiolorum n. sp., gladiolus corm rot due to, 74.
 mold in lemons in Ventura County, 347.
 rot on lemons, effect, 347.
- Bottles, weighing, rapid-closing device, 10.
- Bracken, poisonous properties, 393.
- Brassica*, taxonomic characters, evaluation with key to species and varieties, I, characters, 638.
- Brazil, anopheline mosquitoes, 228.
- Brazil, tea production, U.S.D.A. 666.
- Bread—*see also* Dough.
 baking quality of dry milk solids, 411.
 doughs, freezing before baking, 124.
 enriched, iron in assay by rapid method, 19.
 making, experimental, mixing time, optimum vs. fixed at various potassium bromate levels, 306.
 mold prevented by electronic method, 126.
 molds, spores, ultra-violet irradiation, 323.
 U. S. Army, composition and vitamin retention, 122.
 volume, effect of mixing speed and dry milk solids, 306.
 white, enrichment, symposium, 876.
 yeast, concentrated nutritious loaf, Mo. 411.
- Breeding**—
 livestock, progress report, U.S.D.A. 41.
 method, for potato, Minn. 186.
 plant—
 pollen-excess advantageous, 37.
 research progress reports, U.S.D.A. 141, 142.
 research progress reports, Ala. 148.
- Brewing industry, applied entomology, 85.
- Bristles, artificial, from proteins, 163.
- Broadbean, germination, enzymes, 640.
- Broadbean, new disease due to *Phoma* sp. in Peru, 671.
- Broccoli crops, whiptail control by ammonium molybdate, 512.
- Broilers—
 production, costs and returns, Maine 580.
 successful growing, book, 93.
 thiouracil effects on growth and fattening, 46.
- Bromegrass, seed and seedling infection by *Xanthomonas translucens* var. *cerealis*, 510.
- Bronze birch borer, as pest in Maine, informative account, 84.
- Brucella*—
abortus—*see also* Abortion, contagious.
 agglutinins, transference from cow to calf and persistence in calves blood, 391.
 cows infected with, changes of serum phosphatase level, 390.
 dissociation, inherent and environmental factors in bacterial variation, 560.
 strain 19, comparison with 45/20, 390.
 strain 19, immunizing value, 390.
 strain 19 vaccine, agglutinin response, relation to dosage and site of inoculation, 390.
 strain 45/20, comparison with strain 19, 390.
 strain 45/20, vaccination trials with live cultures of, 102.
 infection, immunization of guinea pigs, 244.
melitensis, occurrence and source in Iowa, 101.
 organisms, culturing from blood clots, 244.
suis—
 cause of orchitis in swine, 565.
 isolation from boar's semen, 717.
 transmission from swine to cattle under pasture conditions, 394.
- Brucellosis**—
 bovine, opsonocytaphagic test in, 102.
 control in domestic animals, progress, 854.
 in dairy herds, control and its relation to milk supply, 716.
 vaccine from strain 45 (20), field trials, 102.
- Bruchus pisorum*—*see* Pea weevil.
- Bruchus quadrimaculatus*—*see* Four-spotted pea beetle.
- Buffalo(es)**—
 gnats, larvicidal control by DDT, 88.
 muscle meat, protein value, comparison with beef and goat, 275.
 water, virus encephalomyelitis in China, 104.
- Buffalo grass seed, development, 658.
- Bufoinae, nematode parasites, 351.
- Bugula neritina*, attachment and growth, toxicity of copper, 358.

Building(s)—

construction, applications of climatology, 630.

farm—

structure program, needs, 257.

textbook, 862.

wiring and lighting, U.S.D.A. 257.

frames, steel, cost, saving in electric welding, Wis. 400.

Bulls, Friesland, breeding value in South Africa, 496.

Bulls, weight, estimation from heart girth measurements, 238.

***Bunostomum trigonocephalum*—**

heavy infections, probable origin, 717.

infections in lambs fed adequately, pathogenicity, 563.

Burning of longleaf-slash pine type, effect on grazing, 57.

Bushes, disease eradication, 518.

Butadiene, from 2, 3-butylene glycol, 164.

1, 3-Butadiene, 2, 3-butylene glycol—
converted to, by pyrolysis of diacetate, 165.
converted to, pilot-plant trials, 165.

2, 3-Butanediol, production from acid-hydrolyzed starch, 766.

Butter—

Arizona, vitamin A content, 278.

bacteriology, study VIII, Iowa 240.

fatty acids—

effect on carotene utilization, 132.

nutritive value, 132.

keeping quality in storage, effect of temperature level, 556.

market, vitamin A and carotene content in Kansas, 892.

packing and storage, V, effect of temperature level on keeping quality, 556.

salt content, estimation by mercurimetric method, 621.

salt distribution and effect on bacterial growth, Iowa 240.

vitamin A potency—

in Louisiana, two-year study, 891.

of creamery, in Minnesota, 133.

wrapping in *Pinus radiata* boxes, use of parchfoil and Pliofilm, 556.

Butterfat—

content of milk, variation, causes, 714.

cost of production in Utah, Utah 726.

needs of young calves, 382.

vs. margarine, in Sherman diet B, effect on growth and reproduction of rats, 129.

*Butyl mesityl oxalate, photochemical dimerization, 4.

2,3-Butylene glycol—

acetylation, continuous process, 164.

conversion to 1,3-butadiene—

by pyrolysis of diacetate, 165.

pilot-plant trials, 165.

in fermentations, assay technique, 16.

recovery from fermentation liquors, 164.

water mixtures, liquid-vapor equilibrium, 164.

Cabbage—

ascorbic acid availability in college women, Iowa 897.

ascorbic acid content, relation to environment and heredity, 896.

maggot, control by DDT, 357.

salads, ascorbic acid content, 602.

yellows-resistant varieties, ascorbic acid content, 334.

Cables, submarine, bacterial corrosion, prevention, 32.

Cakes—

finished, quality, effect of method of combining ingredients, 876.

recipes for different altitudes, 267.

Calamagrostis spp., Scandinavian, genesis, 651.

Calandra oryzae, oviposition, influence of temperature, humidity and density, 226.

Calcite grit, supplement to chick starting ration, 551.

Calcium—

absorption by peanuts from kaolin and bentonite, 787.

arsenate diluents, calcic and magnesic, effect on bean yields, 689.

content of dehydrated green beans, effect of blanching, storage, and cooking, 276.

dietary—

influence of different levels upon egg-shell thickness, 708.

utilization, effect of cocoa, 594.

intake level, influence on complete life cycle of albino rat, 739.

metabolism of preschool children, 595.

pantothenate, absorption and excretion by dogs, 601.

silicate slags, neutralization value, titration, 13.

sources for laying chickens during hot weather, 551.

Calf(ves)—

ascorbic acid, vitamin A, and spinal pressure relationships, 282.

blood, persistence of *Brucella abortus* agglutinins after transference from cow, 391.

dairy, young, value of supplementary vitamins, 382.

diseases and treatment, 855.

dry starters, distillers' byproducts and soybean meal, Nebr. 237.

lungs, embryonal mixed tumor, 387.

newborn—

carotene utilization, 552.

vitamin A reserves, effect of prepartum diet of cow, 382.

nodular worm infections during prepatent period, 388.

raising, modern methods, 238.

scours, infectious, control, 103.

spinal pressure, vitamin A, and ascorbic acid relationships, 282.

steer, fattening, comparison of dried sweet-potatoes, wheat, and corn, progress report, 374.

- Calf(ves)—Continued
 vitamin A, ascorbic acid, and spinal pressure relationships, 232.
 vitamin A requirements, 374.
 wintering well, progress report, 374.
 young, butterfat needs, Minn. 382.
 California agriculture, history, 910.
 California Station—
 notes, 288, 912.
 report, 1945, Calif. 910.
 California University, notes, 288, 912.
Calliphora erythrocephala, life tables, 686.
 Caloric value, of diets, Atwater system of calculation, 130.
 Camellia—
 dieback, cause and control, Miss. 829.
 flower blight, 347.
 Camphor, onion root responses, to, 183.
Campyilotropis n. spp. in Asia, 34.
 Canada—
 agricultural resources, 755.
 food consumption levels, U.S.D.A. 590.
 Canadian Committee on Food Preservation, collected papers, II, 1940-44, 414.
 Canadian Northwest, climatic factors in development, 23.
 Candles, jellied fruit, 266.
 Cane juice, constituents, isolation by chromatographic methods, 301.
 Canine hysteria due to feeding baked dog foods and wheat flour, 234.
Cannabis sativa—See Hemp, American.
 Canned—
 apple juices, 269.
 foods—see also Fruit(s), canned; Meat(s), canned; Vegetable(s), canned.
 home, surface-darkening, prevention, 124.
 nutritive value, VII (a), 283.
 nutritive value, VIII, distribution of mineral nutrients in drained and liquid, 588.
 nutritive value, XI-XII, 628.
 nutritive value, XIII, influence of temperature and storage time on vitamin contents, 742.
 Canning—
 beef, Ga. 269.
 commercial, effect on ascorbic acid content of grapefruit juice, 283.
 community centers, U.S.D.A. 735.
 home—
 I-II, 269.
 jar rings for, specifications, 140.
 sealing qualities of jar rings, 82.
 spoilage prevention, 269.
 vegetables, sources of spoilage bacteria, 124.
 industry—
 insect control by benzene hexachloride ("666"), 85.
 insect control by DDT, 85.
 Cantaloup(s)—
 ascorbic acid content, effect of storage, Del. 895.
 Cantaloup(s)—Continued
 fertilizer and manure treatments on yield, size, stand, and disease resistance, 330.
 powdery mildew, fungicidal control, Calif. 348.
Capitophorus fragariae, means of resolution of strawberry virus complexes, 678.
 Capniidae, Plecoptera, morphology and taxonomy, comparative, 353.
 Capons, stilbestrol producing, 190.
 Capric acid, binary mixtures with caprylic acid, solidification points, 463.
 Caproic acid, attraction for Japanese beetle, 687.
 Caprylic acid, binary mixtures with capric acid, solidification points, 463.
 Capsule staining, sterile milk for background, 313.
 Carbohydrate(s)—
 action of hydrogen peroxide on, 294.
 allyl ethers, III, 293.
 availability, metabolic calculations, 131.
 dietary supply, effect on response of human respiratory quotient after glucose, 594.
 metabolism in humans, text book, 887.
 nutrition, influence on development of hypocotyledonary buds of flax, 322.
 syntheses, mechanisms, 31.
 Carbon disulfide, herbicidal use, Calif. 48.
 Carboxylic acids, toxicity to *Colletotrichum circinans*, effect of pH, 821.
 Carles, dental, production and description in cotton rat, 130.
 Carnations, tetraploid, from interspecific hybridization, 40.
 Carnivores—
 of San Andres Mountains, N. Mex. 682.
Physaloptera of, annotated list, 88.
 Carotene—see also Vitamin A.
 crude, constituents in carrots, 278.
 gossypol as protective antioxidant, 6.
 in—
 alfalfa, chromatographic determination 157.
 alfalfa, correlation with leafhopper resistance, 193.
 blood plasma, form, 132.
 chile, effects of canning and drying, N. Mex. 889.
 corn plant, 193.
 cottonseed oil, stability, effect of antioxidants, 465.
 dehydrated alfalfa, assay by simplified technic, 17.
 foods, extraction and assay, 17.
 foods, values, measurement by storage of vitamin A in rats' livers, 278.
 green fodder, vitamin A activity, 545.
 hay, preservation by autoclaving and waxing, Wis. 297.
 ice cream, 131.
 kale, availability, 598.
 market butter produced in Kansas, 892.
 nutrition of guinea pig, 597.
 plant extracts, effect of storage, 892.

Carotene—Continued

- in—continued
 - plants, determination, 154.
 - rations for sheep and cattle, progress report, 373.
 - rose hips, 424.
 - stored leaf meals and extract, losses, 281.
 - summer squashes, 277.
 - sweetpotatoes, Ariz. 131.
 - sweetpotatoes, effect of curing, S.C. 891.
 - sweetpotatoes, effects of fertilizers, curing, storage, and cooking, Ga. and N.C. 742.
 - vegetables, physiological availability rat, 598.
 - vegetables, value for growth of white rat, 597.
- losses in large-scale cooking, Ala. 131.
- preservation, antioxygenic synergism of tocopherol and rice bran extract, 743.
- rapid determination, apparatus, 298.
- stabilization by nordihydroguaiaretic acid and other antioxidants, 466.
- utilization—
 - by fox pups, comparison with vitamin A, 521.
 - by newborn calf, 552.
 - influence of fatty acids of butter, 132.
- Carotene-destroying system of alfalfa, enzymic nature, 768.
- α -Carotene B, stability and activity, 615.
- β -Carotene—*see also* Neo- β -carotene.
 - highly pure, preparation, 297.
 - isomerization, effect on optical density ratios, 157.
 - vs. cod liver oil, U. S. P. reference, standards in vitamin A assays, 470.
- β -Carotene, absorption spectrum, 615.
- Carotenoid(s)—
 - and vitamin A levels in cattle, 232.
 - content of—
 - carrots, assay by simplified technic, 17.
 - dehydrated egg, 775.
 - peaches, effect of processing, S.C. 891.
- Carpocapsa pomonella*—*see* Codling moth.
- Carion bottles of beet in Switzerland, 359.
- Carrots—
 - blanched, vitamin retention, alcohol-insoluble solids as reference base, 775.
 - carotene, crude, constituents, 278.
 - carotenoids in, assay by simplified technic, 17.
 - production in West and Southwest, U.S.D.A. 815.
 - varieties, susceptibility, relative, to nematode damage, yellows, and defoliation, Ohio 848.
 - weed control by oil sprays, Mich. 328, [N.Y.] Cornell 330.

Casein—

- bristles from, 163.
- effect on pyridoxine-deficient mice, 128.
- iodinated, experiments on farms in England and Wales, 712.

Casein—Continued

- raw and heated, effect of proteolytic enzymes, 449.
- textile fibers from, 163.
- vegetable protein-solution viscosity patterns compared to, 2.
- Cassava pith, superior for free-hand sections, 493.
- Castor-bean hybrids, making, use of natural crossing plot, 806.
- Castor oil, stearic acid preparation, 611.
- Cat, domestic, normal blood count, 248.
- Cats, enteric infections, sulfathalidine treatment, 248.
- Catalyst, copper-chromium oxide, preparation and reclamation, 146.
- Cattle—*see also* Ruminants.
 - achondroplasia, dominant, recurrent mutation, 799.
 - adaptability to tropical and subtropical climates, 703.
- beef—
 - fattening rations in Montana, Mont. 842.
 - feeding tests, progress reports, 373.
 - grazing, July-planted Hodo sorghum unsatisfactory after frosts, Miss. 233.
 - heritability of growth and efficiency, 42.
 - heritability of live animal scores, grades, and carcass characteristics, 324.
 - industry in Gulf Coast States, 703.
 - measurements, relation to weights, 842.
 - weights, relation to objective measurements, 842.
- blood levels of calcium and inorganic phosphorus, U.S.D.A. 546.
- Brucella suis* infection from swine in pasture, 394.
- brucellosis, opsonocytaphagic test, 102.
- carotenoid and vitamin A levels, 232.
- contagious disease associated with *Leptospira*, 561.
- dairy—
 - artificial breeding, practicality, 42.
 - artificial insemination, Mo. 98.
 - blood, total ketone bodies, 238.
 - breeding efficiency in artificial insemination, influence of age, 496.
 - breeding, progress report, 42.
 - cross-breeding, 652.
 - feeds, digestibility, 712.
 - insemination, artificial developments, 800.
 - ketosis, experimental, 560.
 - ketosis, practical discussion, 560.
 - ketosis, studies VII and VIII, 239.
 - polkilocytosis, therapeutic effect of yeast and pyridoxine, 382.
 - rations, defluorinated rock phosphate as phosphorus supplement, 712.
 - research progress reports, U.S.D.A. 97.
 - deficiency diseases, therapeutic effect of small doses of cobalt in Norway, 568.
 - diseases, research progress reports, U.S.D.A. 99.

Cattle—Continued

fattening—

input-output relationships, 725.

rations, Ariz. 90, Wash. 91.

feeds, identification and passage through rumen, 841.

fetal membranes, retained, blood picture, 854.

grazing, use for measuring pasture yields, 373.

healthy, peripheral blood, tick-transmitted protozoa in, 392.

Holstein, history and development in Frederick County, Md., 712.

infectious pyelonephritis, diphtheroids associated, 103.

lead poisoning, 245.

lice, biology and control, [N.Y.] Cornell 838.

measurements, standardization, 703.

molybdenum poisoning, 393.

poisoning by *Lantana*, 855.

pregnancy test, colostrum, 652.

range, horn flies and Gulf coast ticks, control by DDT, 542.

Red Poll pedigree population, growth and distribution in England, 496.

research progress reports, U.S.D.A. 90.

roughage digestibility, crude fiber effects, 91.

selective breeding, duration of pedigree herds, 495.

ticks, control by DDT-rotenone combination in tropical regions, 543.

tuberculin test, intradermal, reaction, blood leucocyte picture, 563.

vaccinated with *Brucella abortus* strain 19, immunity, 390.

vitamin A and carotenoid levels, 232.

zebu, roughage, digestibility, crude fiber effects, 91.

Cauliflower—

ascorbic acid content, effect of blanching, 281.

whiptail control by ammonium molybdate, 512.

worms, control on Long Island, 691.

Cecal worms in turkeys, control by phenothiazine, limitations, 569.

Cedar—

Bermuda, insects and pests attacking, survey report, 864.

northern white, in Maine, preliminary observations, 333.

western red, heartwood extract, antibiotic activity, 483.

Cell(s)—

bacterial, cytoplasmic membrane, morphology and nature, 81.

living, and radiation, 648.

proliferations, camphor causing in onion roots, 183.

Cellulose—

bacterial culture decomposing, characteristics, 31.

Cellulose—Continued

bacterial decomposition, carbon dioxide essential factor, 483.

content of *Sphagnum*, nature, 645.

fabrics, flow properties of cuprammonium

dispersions, fluidity calculations, 138.

hydrolysis, method, 21.

Micromonospora proprotionici decomposing, 31.

of bacterial and animal origin, fibrillar structure, 647.

saccharification, quantitative method, 162.

termites decomposing, mechanism, 31.

Cellulosic materials, effects of temperature and humidity, 284.

Centipedes from Georgia, 351.

Centrifuge tube agitator, construction and operation, 149.

Cephaleuros, ascomycetous parasite, 336.

Cerambycid beetles—

in Ohio, identification, 831.

of *Stenospheenus* in America north of Mexico, synopsis, 221.

Cercopidae, spittlebugs of Missouri, 221.

Cercospora oryzae, new race, 334.

Cereal(s)—

amylase inhibitor, distribution and general properties, 612.

black bacteriosis, tyrosinase factor, 63.

cytology, II, 648.

diseases, 334.

fermentation liquors, 2, 3-butylene glycol recovery, 164.

greenbug in Uruguay, 688.

industries, applied entomology, 85.

packaged, shelf life, determination, 266.

products—

fats, oxidative deterioration, 266.

thiamine and riboflavin contents, combined determination, rapid method, 470.

thiamine content, determination, simplified colorimetric method, 471.

root ellworm, *Heterodera major* in North Wales, 670.

rust control by barberry destruction, 63.

seed-borne diseases, prevalence and control in Manitoba, 62.

sprouts, dietary substitute for fresh vegetables, 266.

vitamin-fortified, stability of thiamin-chloride, 431.

vitamin B¹ content and supplying human requirements, 428.

winter, gas change and frost hardening, 486.

Xanthomonas translucens, parasitism, 62.*Chaetomium* spp., differential isolation from mixed populations by hypochlorite solution, 336.

Chafer, European, in lawns, control, N.Y. State and Cornell 360.

Chagasia roseboomi, anopheline from Ceará, Brazil, 228.*Chalaropsis thielavioides*, cause of failure of bud and graft unions of rose, 218.

- Chalcid fly, six new genera, descriptions, Iowa 534.
- Charcoal kiln made of cinder-concrete blocks, Conn. [New Haven] 572.
- Chattia setosa*, n. gen. and n. sp., chigger from northwestern U.S., 700.
- Cheatgrass brome, competition, effects on wheatgrasses, 327.
- Cheese—
bacteriophage studies, 557.
- Cheddar—
curing, influence of temperature, 715.
phosphatase test, 20.
slowness control in making, 99.
coloring by annatto, II, 557.
fatty acids, volatile, determination, simplified extraction-distillation method, 774.
making, balance of milk nutrients and their fate during ripening, 558.
new, salt content, estimation, by mercurimetric method, 621.
pricing problems, 730.
quality and vitamin content, relation to corn and alfalfa silage, 241.
- Chemical compounds, colorless, adsorption analysis, technique, 155.
- Chemicals, feeding to plants and animals for pest control, 527.
- Chemistry—
agricultural, research progress reports, U.S.D.A. 140, 141, 142, Ala. 143.
organic, physical methods, II, volume 2, 762.
organic syntheses, book, 1.
statistical methods, 1.
- Chemotherapy of cecal coccidiosis of chickens, IV, 720.
- Cherry(ies)—
culture in Missouri, Mo. 202.
dehydration of Montmorency, Mich. 123.
fruitfly problem in eastern Washington, 363.
sand, leaf curl and pockets, control, 828.
sour, yellows virus, expression, effects of temperature, 645.
sweet, new varieties, Idaho 53.
- Chestnut trees, old Japanese, vigor and susceptibility to blight, effect of mineral nutrition, 681.
- Chick(s)—*see also* Chicken(s); Ducks; Fowl; Hens; Poultry; Pullets.
absorption of cinchona alkaloids and relation to antimalarial activity, 248.
allantois, regulation, 499.
availability of cystine and methionine, influencing of autoclaving soybean-oil meal, 847.
- baby—
sex identification by color in Brown Leghorns, 45.
sex identification in "red" varieties, 45.
toxicity of sodium chloride solution, 858.
bacterial syndrome in epidemic pullorum disease, 106.
blood, cellular elements, relation to crystalline vitamin B₂, 234.
- Chick(s)—Continued
cecal coccidiosis—
effect of sulfaguanidine, Del. 585.
treatment with sodium sulfamerazine, 251.
cerebellar disorder nutritionally produced, not associated with E avitaminosis, 550.
choline-like effect of dimethylaminoethanol in ration, 94.
color sexing Rhode Island Reds and New Hampshires, wing-spot method, 326.
diet, monomethylaminoethanol and dimethylaminoethanol, effects, 549.
embryos—
infection with nonpigmented forms of *Plasmodium gallinaceum*, 250.
Leghorn and polydactylous, effect of local applications of colchicine, 653.
strophosomy production by local applications of colchicine, 653.
encephalomalacia, nutritional, 396.
fattening potency of estrogen feeding, rapid assay method, 46.
fed high corn diet, effect of nicotinic acid, 549.
feeding sunflower seed meal, 235.
feeding thlouracil, desiccated thyroid, and stilbestrol derivatives, effects, 499.
feeding varying amounts of riboflavin, results, 548.
goitrogenic effects of rape seed in, 46.
growing—
nutrition, calcium, phosphorus, and vitamin D interrelationships, 550.
phosphorus sources, sodium acid phosphate, tri-calcium phosphate, and bonemeal, 551.
utilization of food elements, X, Comparison of open-pollinated and hybrid corn, Nebr. 378.
utilization of food elements, XI, comparison of ground wheat and ground rye, Nebr. 547.
growth response to methionine in rations, 94.
immunizing exposure to cecal coccidiosis, use of chemotherapy, 720.
liver, formation of folic acid, 616.
liver lipids, effect of vitamin K deficiency, 720.
newly hatched, pantothenic acid content, relation to content of eggs, 378.
nicotinic acid requirement, influence of gelatine and tryptophan, 549.
nutritional value of yeast protein, 591.
ovarian effects of FSH and LH, 189.
perosis caused by feeding high levels of thlouracil, 567.
pituitary-gonadotropin response, 189.
pregnant-mare serum response, 189.
pullorum disease—
control, 106.
diet effects on epidemic, 106.
treatment by sulfamerazine, 568.
whole-blood test, 106.

Chick(s)—Continued

- purified rations, activity of synthetic folic acid, 549.
- pyridoxine requirement, 94.
- rations, shark meal as protein supplement, 707.
- sodium chloride ingestion, excessive, effect, 105.
- starter ration—
- supplements, calcite grit and granite grit, 551.
- vegetable protein concentrates alone and with supplements, 93.
- sulfonamide toxicity, evaluation, 106.
- thyroid gland, effect of feeding thiouracil, 234.
- tongue deformity, amino acid-deficiency role, 105.
- unabsorbed yolk in body cavity, 551.

Chicken(s)—see also Chick(s); Cockerels; Fowl; Hens, Poultry.

- blood, inoculation with Japanese B encephalitis virus, 367.
- body louse, control by DDT, 88.
- body measurements, relation to breast meat and live and dressed grades, 709.
- breeding for increase of life span, Va. 710.
- cecal coccidiosis—
- chemotherapy, IV, 720.
- established infections, use of drugs, 251.
- experimental, sulfamerazine therapy, 308.
- cannibalism, 251.
- coccidiosis infection, experimental, effect of aryl arsonic acids, 567.
- feeding meat and bone meal, 397.
- growing, diet, choline content, toxicity, 858.
- growing, feed utilization, relation to shank length, 707.
- growing, on range and pasturage, new ration, Ohio 847.
- immunity to *Plasmodium* spp., 250.
- in vitro opsonic tests with *Plasmodium* spp., 250.
- inbreds, development and use, 498.
- infection with *Eimeria tenella*, effect of sulfaguanidine, 397.
- infected with *Eimeria tenella*, toxicity of cecal cores, 387.
- laying, calcium sources during hot weather, 551.
- lymphoid tumor, immunisation against, III, attenuation by heat, drying, and chemicals, 566.
- malaria, parasitemia, increase following X-irradiation, 249.
- meat type score, relation of edible percentage of meat, Mich. 380.
- mite, encephalitis virus (St. Louis) congenial, 101.
- osteopetrosis, production by filtrable agent, 396.
- pancreas, vitamin B. conjugase, 614.
- poisoning by ANTU, 854.

Chicken(s)—Continued

- precipitin production, II, in vitro rise of interfacial titers and precipitin formation, 506.
- prophylactic vaccination against infectious laryngotracheitis, 252.
- rations, corn-and-cob meal versus ground shelled corn, 847.
- rumpleness, insulin-induced, II, III, 802.
- tumors, lymphoid, production by filterable agent, 396.
- Chickpea, heterochromatic attraction and secondary association, 649.
- Chigger(s)—
- culturing, 544.
- mite, *Eutrombicula batatas*, habits and life history, 544.
- new genus and species, *Ohatia setosa*, from northwestern U. S., 700.
- Children—
- nutrition and chemical growth, II, original data, 274.
- preschool—
- calcium metabolism, 595.
- citrate metabolism, 129.
- food intake, factors influencing, 274.
- school, diet, relation to tooth and bone structure in Florida, Fla. 886.
- Chile—
- agricultural policy, U.S.D.A. 263.
- carotene and ascorbic acid content, effects of canning and drying, N.Mex. 889.
- citrus industry, U.S.D.A. 507.
- China—
- plant hunting, history of botanical exploration, 637.
- powdery mildew fungi, taxonomy, 200.
- Chinch bug, dust barrier tests, 77.
- Chinese gallnuts, general study, 57.
- Chloramine, bactericidal values, comparison with chlorine, 100.
- Chloride, effect on pecan and other native Oklahoma trees, Okla. 204.
- Chlorine, ovicidal value for *Aedes aegypti* eggs, 368.
- Chlorochroa sayi*—see also Say stinkbug.
- damage to sugar beets grown for seed, 834.
- Chloronitrobenzene, control of club-root, potato scab, clover stemrot, and brown root-rot of tomato, 676.
- Chlorophyll,—
- content of—
- plants, determination, 154.
- summer squashes, 277.
- rapid determination, apparatus, 298.
- Chloropidae, Iowa species, list, 534.
- Chloroplasts, frozen, dried, and homogenized, illuminated suspensions, oxygen evolution, 646.
- Chlorosis—
- high-lime, relation to ferrous and ferric iron, 788.
- in citrus leaves, control 828.
- lime, in fruit trees, catalase variations in, 78.
- lime-induced in Idaho plants, Idaho 58.

Cholesterol, separation from degrass, 156.

Choline—

analogs, utilization by cholineless mutants of *Neurospora*, 422.

content of—

dairy products, microbiological assay, 20.

diet of growing chickens, toxicity, 858.

wheat, oats, barley, flax, soybeans, 273.

deficiency, fatty liver, effect of chain length of fatty acids, 129.

excessive ingestion, effect on amount in tissues and urine of dogs and sheep, 128.

excretion from human body, effect of choline intake and environmental temperature, 422.

requirements of hens, 707.

Choline-like effect of dimethylaminoethanol in chick rations, 94.

Chorionic gonadotropin, effects on cystic ovaries in cow, 392.

Chortoicetes terminifera—see Locust, Australian plague.

Christmas trees, species and culture comparisons, Ala. 57.

Chromates in animal nutrition, 388.

Chromium oxide-copper catalyst, preparation and reclamation, 146.

Chromosome(s)—

number in chickpeas, 649.

numerous, counting technique, 494.

of cultivated plants, atlas, book, 648.

Chrysanthemum aphid, wing production, genetic mechanism, environmental conditions affecting, 654.

Chrysopa dorsalis, biological notes, 86.

Chrysophyllum spp. of South America, 638.

Chufas, uses and cultivation, Fla. 193.

Chytrids, Brazilian—

VIII, parasites of rotifers and nematodes, 637.

IX, species of *Rhizophyidum*, 637.

Cicada, 17-year, notes for 1945, 686.

Cicadellidae of America north of Mexico, check list, Ohio 534.

Cicer arietinum, secondary association and heterochromatic attraction, 649.

Olliochorella bambusarum n. sp., cause of leaf spot of bamboo, and description, 679.

Cimex lectularius—see Bed bugs.

Cinchona—

alkaloids, absorption in chick, and relation to antimalarial activity, 248.

officinalis, tests for Colombian Andes, 55.

Peruvian, alkaloids, distribution in bark, U.S.D.A. 148.

tests for Puerto Rican culture, U.S.D.A. 55.

Citellus mexicanus, ground squirrel, 683.

Citrate metabolism, of preschool children, 129.

Citric acid, assay in fermentation media and biological materials, 14.

Citriovir pertinaciae, virus of stubborn disease of citrus, 828.

Citronella oil production in Guatemala, U.S.D.A. 667.

Citrus—see also specific kinds.

fruits—

processing and marketing, readjustments, U.S.D.A. 870.

production, disposition, value and utilization of sales, 1909-44, U.S.D.A. 405.

rots caused by *Penicillium*, 217.

storage physiology, 666.

surface and volume determinations, tables, 53.

tolerance to methyl bromide as fumigant, Calif. 538.

ganoderma root rot, 679.

harvest wages, Los Angeles area, April-June 1945, U.S.D.A. 406.

industry of Chile, U.S.D.A. 507.

industry of Florida, Fla. 332.

insects, control by DDT, 225.

juices—

deterioration in storage, causes, 125.

fresh, ascorbic acid and flavor retention, 138.

leaves—

and rootlets, composition, influence of rootstock, 332.

chlorosis, control, 828.

petroleum oil spray deposits, determination, 305.

Platypus compositus attacking, 77.

psorosis, additional information, 217.

relations of 10 elements and deficiencies in Calif., 346.

stubborn disease, virosis, symptoms, 828.

trees, mineral nutrient deficiencies in California, causes, 217, 346.

trees, rootlet rot, relation to nematodes, 679.

tristeza disease—

identification by iodine test, 679.

relation to nematodes, 679.

volatile oils, assay apparatus, 10.

Clays—

bonding action, II, dry molding sands, 861.

colloidal cultures, clay preparation and use as plant growth medium, 782.

minerals, soil-structure role, 169.

Cleaning solvents, compositions and trade names, 140.

Clear Lake gnat, light-trap studies, 534.

Click-beetles, birds eating in Utah, 77.

Climate—

and insect life, 169.

changing, 629.

crop-production factors, 23.

effect on grapes in Michigan, 1945, 311.

of—

Arizona, 629.

China, effect on agriculture past and present, 23.

northwestern Canada, 23.

Scotland, problems, 23.

Texas, 629.

Climate—Continued

prairie, trees, injury, death, and recovery, 167.

Climatology—

agricultural, analogs in Ukraine and Norway vs. U.S.A., U.S.D.A. 168.

applications to building construction and agriculture, 630.

use of punched cards, 629.

world, treatise for advanced students, 474.

Clostridium—

acetobutylicum, riboflavin synthesis influence of iron inactivation by 2, 2'-bipyridine, 31.

botulinum—

incidence and distribution in Illinois soils, 272.

occurrence in soil samples, 25.

type C, cause of duck disease at Tulare Lake, 253.

infection in range animals, 717.

tetani, occurrence in soil samples, 25.

Clothes moths, control by DDT, thermal aerosol fogs in wool storage warehouse, 697.

Clothing—

make-overs, new ideas, 285.

research progress reports, U.S.D.A. 142.

tailoring techniques for woman's suit, U.S.D.A. 139.

Clouded sulphur (butterfly), migrations in central U.S.A., 80.

Clouds, lower, comparison of bases with condensation levels, 23.

Clove oil, imitation, effectiveness in spicing pickles, 267.

Clover—

alsike, seed production, honeybee role, Mich. 89.

and nodule bacteria, symbiosis, genetic factors, 651.

nodule bacteria, variation within strains in size of nodule and effectivity of symbiosis, 638.

root nodule bacteria isolated from, host specificity, 316.

rot in Britain, 337.

stemrot, control by chlornitrobenzene, 676.

white—

seed production, honeybee role, Mich. 89.

self-compatibility factor and relation to breeding methods, 186.

virosis-like genetic disease, 39.

yield increase by manuring, La. 193.

Clubroot of crucifers, control by chlornitrobenzene, 676.

Coal, applications to Utah soils, results, 789.

Coating material, new synthetic, Norelac, 466.

Cobalt—

deficiency disease of livestock, in Australia, 169.

efficacy in combating deficiency diseases of cattle and sheep in Norway, 563.

Cobalt—Continued

feeding for prevention of "pining" in Cornwall and Devon, 704.

in biological materials, determination with nitrosocresol, 151.

soil deficiency in Australia, 169.

Coccidiosis—**cecal—**

effect of sulfaguanidine, Del. 585.

of chickens, chemotherapy, IV, 720.

of chickens, effect of aryl arsonic acids, 567.

of chickens, sulfamerazine therapy, 398.

of chickens, use of drugs, 251.

treatment by sodium sulfamerazine, 251.

intestinal, in commercial rabbitries, control by phthalylsulfathiazole, 387.

Coccus hesperidum—see Soft scale.

Cochliomyia americana, population in Arizona, 369.

Cockerels, breeding, selection by sisters' performance, 44.

Cockroach(es)—

arsenite-injected, concentration-survival time curves, analysis, 539.

site of action of DDT, 227.

Cocks, old, meat quality, effect of estrogens, 709.

Cocoa, effect on utilization of dietary calcium, 594.

Coconut—

diseases of leaves, crown, and stem, 74.

palm, disease in Jamaica, 519.

Cod-liver oil—

effect on flavors and vitamin C content of milk, 554.

U.S.P. reference vs. beta-carotene, standards in vitamin A assays, 470.

Codecarboxylase—see also Pyridoxal phosphate.

assay system, 179.

comparison of natural and synthetic, 179.

conversion of vitamin B₃ group, 769.

Codling moth—

attacking pear and apple, life history differences, 693.

control with DDT—

in Colorado, Colo. 693.

in Virginia, 356.

in western New York, N.Y. State and Cornell 362.

in western New York in 1945, 694.

precautions, 694.

control with lead arsenate, influence of ingredients and dosage, Va. 694.

from walnuts, apples, and pears, emergence time, longevity, and oviposition, Calif. 536.

hibernating larvae, susceptibility to low temperature, and bound-water content, U.S.D.A. 536.

in Oklahoma orchards, control, 537.

larval control by—

4,6-dinitro-o-cresol tests on overwintering larvae, 77.

- Codling moth—Continued
larval control by—continued
4,6-dinitro-o-cresol, toxicity persistence on tree trunks, 77.
N-substituted 2,4-dinitroanilines on larvae, 77.
N-substituted p-toluenesulfonamides, 77.
α-trichloromethyl-substituted benzenes, 77.
- Coffee—
Dominican, U.S.D.A. 507.
plant, nitrate utilization under different sunlight intensities, U.S.D.A. 203.
pulp, feed value for livestock, 372.
soil, saving in Puerto Rico, U.S.D.A. 666.
- Colchicine—
effect on development and maturing of polyspermic corn, 39.
in combination with X-ray, effect on plant tissue, 207.
review of research of five years, 185.
- Colias—
philodice eurytheme—see Alfalfa caterpillar.
philodice philodice—see Clouded sulphur spp., migrations in central U.S.A., 80.
- Coliform bacteria, differential tests, influence of incubation temperatures, 634.
- Colleges, land-grant, workers in subjects pertaining to agriculture, 1945-46, U.S.D.A. 875.
- Colletotrichum*—
circinans, toxicity to of carboxylic acids, phenols, and crucifer extracts, effect of pH, 821.
illi in lily bulbs, eradication action of fungicide, 347.
- Colloids, classes, systems representative, electro-viscosity data, 467.
- Colloidal clay cultures, clay preparation and use as plant growth medium, 782.
- Colombia—
agricultural prices and wages, 724.
Haemagogus mosquitoes, 228.
- Color—
science, selected references, 433.
standards for McIntosh apple leaves, N.Y. State and Cornell 816.
- Color-inhibiting factor in onion, relation to smudge resistance, U.S.D.A. 216.
- Colorado potato beetle—
adults attacking their own eggs, 359.
attractant to potato leaves, purification, first attempts, 225.
burrowing, contact, thigmotaxis and sensory localization, 225.
larvae, attack on tubers, 225.
- Colorado A. and M. wool laboratory, capacity increase, 285.
- Colorado College, notes, 445, 911.
- Colorado Farm Bulletin—
September-October, November-December, 1945, Colo. 287.
January-April 1946, Colo. 444.
May-June 1946, Colo. 756.
- Colorado River Basin, stream flow measurements, 1944, 899.
- Colorado Station—
notes, 445, 991.
report, 1944-45, Colo. 436.
- Colorimeter, photoelectric, use in study of bodily storage of vitamin A, 599.
- Colorimetric determination of potassium, 800.
- Colorimetry, disk method, handbook, U.S.D.A. 11.
- Colostrum, vitamin contents in cow and ewe, 98.
- Colts, infectious anemia, 719.
- Columbines, taxonomic monograph on cultivated and wild, 84.
- Committee on Food Research, conference on deterioration of fats and oils, 418.
- Commodity futures statistics, July 1944-June 1945, U.S.D.A. 585.
- Commodity Credit Corporation Purchase Plan, wool clip, 1944, marketing, U.S.D.A. 729.
- Common malaria mosquito—
control by pyrethrum and DDT aerosols, laboratory tests, 941.
densities, measuring technique, 77.
- Comstock mealybug, occurrence, at Niagara Falls, Ont., 687.
- Concrete, curing with sealing compounds, 571.
- Condensation levels in air, comparison of lower-cloud bases with, 28.
- Confused flour beetle—see *Tribolium confusum*.
- Connecticut [New Haven] Station, notes, 607.
- Conocephalothrips tricolor*, n. gen, n. sp., new urothripid from Hawaii, 881.
- Consumption, non-food, of civilians, impact of war in United Kingdom, U.S., and Canada, report, 590.
- Containers, for foods in postwar markets, U.S.D.A. 126.
- Contarinia sorghicola*—see Sorghum midge.
- Convolvulus*—
arvensis, variations, 49.
sepium, Duvel buried seed experiment, U.S.D.A. 201.
spp. of California, types, 638.
- Cookies, recipes for different altitudes, 267.
- Cooking—
ascorbic acid and carotene losses in large-scale, Ala. 131.
dehydrated foods, method, improvement, 589.
- Cookery, practical, and etiquette of table service, book, 267.
- Cooking utensils, sanitization in institutions, 126.
- Cooperation, American farm, 1942-45, 732.
- Cooperative(s)—
and postwar relief, 407.
canning—
1943-44, U.S.D.A. 584.
status, 1943-44, 584.

Cooperative(s)—Continued

- extension work in agriculture and home economics, 1945, report, U.S.D.A. 784.
- farmers'—
 - membership relations, Okla. 264.
 - organizing, U.S.D.A. 118.
 - regional purchasing associations, research practices and problems, U.S. D.A. 408.
 - thirteen, operations and management in north Georgia, 1944, Ga. 871.
- movement and present-day problems, rehabilitation and reconstruction, 407.
- organizations serving farmers in five Ohio counties, relationships, Ohio 871.
- petroleum, affiliated with Southern States Cooperative, Inc., delivery efficiency, U.S.D.A. 408.

Cooperative Rubber Research Station, Costa Rica, U.S.D.A. 204.

Copper—

- distribution and content of blowflies, 541.
- effect on linoleic acid autoxidation, N.Y. State 147.
- fungicidal action, mechanism, 62.
- fungicides—
 - control of potato blight, 672.
 - cryolite compatibility, 80.
- in plants, determination by ashing procedures, 152.
- ions, translocation in plants, 643.
- naphthenates, value as wood preservatives, 519.
- 8-quinolinolate, promising fungicide, 670.
- reduction method, for 'sugar assays, 15.
- rot-proofers, treatment of cotton fabric, effect of weathering, 604.
- sulphate and Black Leaf 40—*see* Cunic.
- toxicity to *Bugula neritina*, 358.

Copper-chromium oxide catalyst, preparation and reclamation, 146.

Coprinus spp., growth at various H-ion concentrations, preliminary contribution, 487.

Coprophy, self-selection by rats, source of vitamin B complex, 279.

Corchorus spp.—*see* Jute.

Cordulidae, distribution and seasonal abundance in Indiana, 80.

Cork oak, bibliography, U.S.D.A. 338.

Corn—*see also* Maize; *Zea mays*.

borer—

- European—*see* European corn borer.
- observations in 1943, 834.
- carotene content of plant, 193.
- chemical composition of diploid vs. tetraploid, 6.
- colchicine effects on development and maturing of polyspermic, 39.
- convergent improvement and backcrossing, Minn. 494.
- deterioration in storage, relation to molds, review, 337.
- development in U. S., Mexico, and Central America at different latitudes and altitudes, 502.

Corn—Continued

- diseases, 334.
- double crosses, predicted performance vs. predicted and actual performance in later years, 194.
- ear, drying, preliminary report, Nebr. 255.
- ear rot due to *Physalospora* *seae*, 65.
- earworm, observations in 1943, 834.
- feeding to chicks, effect of nicotinic acid, 549.
- green feed supplement for livestock, 90.
- Helminthosporium turcicum* leaf blight, 824.
- hybrids—
 - and varieties, tests in Mississippi, 1945, 806.
- performance tests, 1945, N.C. 192.
- tests in Illinois, 1945, Ill. 502.
- inbred lines, early testing, 806.
- kernels, immature, 3-indoleacetic acid isolation, 35.
- meal—
 - and grits, facts and receipts, 588.
 - crude fiber content, determination by biochemical method, 620.
- white, shortage effects, 591.
- milling, wet, effect of sulfurous acid steep, 451.
- nicotinic acid-deficiency role, 135.
- nitrogen—
 - fertilizer, placement, U.S.D.A. 633.
 - metabolism, influence of ammonium nutrition, 794.
- oil, fatty acids, 295.
- open-pollinated and hybrid, comparison for growing chicks, Nebr. 378.
- performance tests of varieties and hybrids (1945), Iowa 195, Okla. 195, S.Dak. 195.
- phytomorphic root rot, as influenced by carbohydrates and root microfloras, 65.
- plants, distribution in field, 806.
- potash deficiency in growing, correcting, Tenn. 47.
- rootworms, general study in Nebraska, Nebr. 83.
- seed—
 - drying temperatures for, factors determining, Ind. 195.
 - storage insects, control 836.
 - treatment by slurry method, 671.
 - treatment in Oklahoma, Okla. 210.
- shucks to beef, N.C. 547.
- smut fungus, sporidial fusion, U.S.D.A. 210.
- soil tests in Nebraska, 481.
- starch content, determination improvements, 472.
- steep liquor, role in production of penicillin, 612.
- sweet—
 - combining ability of successive generations of inbred, Conn. [New Haven] 38.
 - inbreeding by nonindividual pedigree method, Conn. [New Haven] 39.

Corn—Continued

sweet—continued

Japanese beetle abundance and injury, N.Y. State 361.

"long husk" sterility, Conn. [New Haven] 186.

seed treatments, N.J. 216.

suckering trials in California, Calif. 815.

U.S.D.A.—34, variety for Puerto Rico, U.S.D.A. 505.

waxy vs. nonwaxy for dry-lot fattening of pigs, 92.

whole kernel, raw and canned, maturity measurement by succulometer 770.

yields—

effects of lime, fertilizer, and preceding legumes, on Sango silt loam, Tenn. 803.

improved by legumes, La. 194.

relation to nutrient balance, shown by leaf analysis, 658.

Corn-and-cob meal versus ground shelled corn in rations for chickens, 847.

Corncohs to beef, N.C. 547.

Cornea—

lesions, healing, effects of light, trauma, riboflavin, and ariboflavinosis, 600.

vascularity, production, effects of light, trauma, riboflavin, and ariboflavinosis, 600.

Corneal vascularization in rats on tryptophan-deficient diet, 737.

Cornell Station—

notes, 607.

report, 1945, 908.

Cornell University, notes, 446, 607.

Cornstalk rots in Virginia (1945), U.S.D.A. 58.

Coronimya, review with key to species and new taxonomy, 687.

Corynebacterium—

equi, foal infection, 100.

forms in bovine infectious pyelonephritis, 103.

ovis, abscesses in goats caused by, 104.

pyogenes, survival in discharges from udder and uterus of cow, 391.

Cotamia venosa n. g. and n. sp., description, 534.

Cotton—

acreage and prices in Tennessee, Tenn. 111.

aphid, outbreaks and control, Ark. 834.

aphid-resistance, test, 81.

carbohydrate exchange, influence of aphids, 359.

crop insurance in Tennessee and United States, Tenn. 583.

experiments, error, source in environmental modification of fiber properties, U.S.D.A. 806.

fabrics—

containing copper rot-proofers, effect of weathering, 604.

flameproofing for outer garments, 434.

Cotton—Continued

fabrics—continued

manufactured in Alabama, comparison with similar fabrics in ready-to-wear garments, 749.

rotproofed, soil burial test, 900.

treated, resistance to attack by termites and microorganisms, 604.

used for glass curtains, Ohio 750.

utilization, styles study in Alabama, 749.

farm production, disposition, and value, 1928-44, by States, U.S.D.A. 264.

farming, U.S.D.A. 261.

farms, labor changes in Arkansas, 1939-44, 866.

fiber—

isolation of l-malic acid and citric acid from, 295.

raw, organic acid content, 295.

properties, environmental modification, source of error in experiments, U.S.D.A. 806.

wax determination by alcohol extraction method, 155.

fruiting and shedding, relation to light and other limiting factors, Tex. 659.

galloping wilt, physiology, 338.

gin operation, economics of, Miss. 115.

ginning, effects of farm mechanized production, 572.

heat-resistance of leaves on saline soils, 36.

insect pests, status and control in Lower River districts of Nyasaland, 535.

insects, control by benzene hexachloride, 535.

nitrogen for, liquid and solid sources, Miss. 177.

phytomotrichum root rot, influence of carbohydrates and root microfloras, 65.

plant, foliar hydration, VII, size factor, 644.

rat—

dental caries, III, effects of dietary carbohydrates, 420.

dental caries, IV, effects of fluorine, 420.

dental caries, V, influence of strain variation, 421.

parasite, *Atricholaelaps sigmodoni* n. sp. with notes on *Atricholaelaps* and *Ischnolaelaps*, 701.

studies, 351.

root bark, electrodialyzable constituents, identity, 466.

rotated with peanuts, potash and lime requirements, 807.

rust, nutritional factors influencing, 196.

salt-resistance, as influenced by day length, 185.

thread, sewing, selection, Ohio 751.

varieties—

in hill section agronomic data (1941-45), Miss. 196.

in hill section, comparisons (1945), Miss. 196.

Cotton—Continued

varieties—continued

performance tests (1945), N.C. 192.

tests in Georgia, 1942-45, Ga. 502.

yarns, carded and combed, knitted fabrics, physical properties, 483.

yields, effect of—

crop rotation, Miss. 654.

plowing under hairy vetch, 196.

Cottonseed—

extractable gossypol in, assay, spectrophotometric method, 14.

farm production, disposition, and value, 1928-44, by States, U.S.D.A. 284.

longevity, influence of climate and seed treatments, 196.

marketing in Louisiana, La. 584.

meal and meats, gossypol content, estimation, 776.

meal, extractable, gossypol in, assay, spectrophotometric method, 14.

oil—

carotene content, stability, effect of antioxidants, 465.

fractional crystallization from solvents, tocopherol concentrates, 458.

gossypol content, estimation by spectrophotometric method, 776.

hydrogenated, molecular distillation, with characteristics of distilled fraction, 458.

hydrogenated, stability, effect of metallic salts, 457.

oxidation, red quinoid substance developed, γ -tocopherol as precursor, 459.

solvent extraction, techniques, 147.

thermal properties, 455.

pigments, four, 452.

proteins, color improvement, 764.

Cover crops, influence on wireworm injury to tobacco, Conn. [New Haven] 691.

Cows—

acetoneuria, use of chloral hydrate and sodium bicarbonate, intoxications, 716.

artificial insemination, techniques, 42.

blood, contents under various physiological conditions, 383.

breeds, influence on feed cost of milk production, 552.

cobalt-deficiency disease, in Australia, 169.

colostrum, vitamin contents, 98.

cystic ovaries, effects of chorionic gonadotropin, 392.

dairy—

Cornell, comparative size, N.Y. [Cornell] 711.

ketosis, vitamin A therapy, 560.

live weight, variations, Vt. 850.

live weight versus metabolic body size, 711.

long life, advantages, 851.

potato silage, making and feed value, U.S.D.A. 881.

reproduction and lactation, references to literature of 1940-48, 552.

Cows—Continued

dairy—continued

respiration rate, body temperature, and pulse rate, factors influencing, 850.

sterility, genes for, 187.

dystocia from uterine torsion, instrument for relieving, 100.

feeding cod-liver oil, effect on flavors and vitamin C content of milk, 554.

feeding iodinated casein on farms in England and Wales, 712.

heifer, ketonemia in fetus of, 100.

infected with *Brucella abortus*, changes of serum phosphatase level, 390.

mammary gland, penicillin (infused) effects, 102.

manure feeding, effect on egg production and hatchability, 95.

milk—

concentrates, wild yellow mustard seed and fanweed seed, Mont. 849.

feeds, comparison of molasses-grass with barley-grass silage, N.J. 236.

feeds, comparison of molasses-timothy with barley-timothy silage, N.J. 236.

grading as calves for mammary development, 238.

grazing performance, effect of warm weather, 380.

summer feeding on pasture, Ohio 381.

winter feeding of simple vs. complex grain, Ohio 98.

normal, isolation of diphtheroids, 717.

prepartum diet, effect on vitamin A reserves of newborn offspring, 382.

pyometra following retained fetal membranes, effects of stilbestrol, 392.

sterility, research progress reports, U.S.D.A. 99.

udder and uterus, discharges, survival of *Corynebacterium pyogenes*, 391.

udder, invasion by heat-resistant bacteria from unclean milking machine, 851.

Coyotes, decoying, method, 682.

Cranberry (ies)—

fruitworm infestation of blueberries, control, 836.

insects and weather affecting, report, 836.

storage investigations, Mass. 401.

Crane-flies, undescribed species from western U.S. and Canada, 687.

Cream, frozen, physical stability, contributing factors, 385.

Credit—

forest, 1930-45, U.S.D.A. 206.

tallied, for land improvement, 724.

tobacco farms in Puerto Rico, 1939-40, P.R.U. 727.

Crepis spp. and interspecific hybrids, cytogenetic study, karyotype evolution, 649.

Crioceris lili, damage in Britain, 696.

Cronartium—

fusiforme, damage to slash pine, Miss. 219.

occidentale, differentiation from *C. ribicola* in telial stage U.S.D.A. 58.

Oreomyza—Continued

ribicula, differentiation from *O. occidentalis* in telial stage U.S.D.A. 58.

Crops—

agricultural, research progress reports U.S.D.A., 140.

and soils of Oklahoma, report, 1946, Okla. 753.

climatic factors in production, 23.
diseases, outstanding, and uses of fungicides in U.S., 508.

ecology, analogs in Ukraine and Norway vs. U.S.A., U.S.D.A. 168.

farm, research in Mississippi, Miss. 804.

fertilizer effects on yields and composition, 173.

field, diseases, 335.

garden, diseases in Georgia (1945), U.S.D.A. 58.

garden, seed treatments in western Washington, Wash. 215.

nickel deficiency, 509.

on acid soils, manganese toxicity, 509.

residues, soil-temperature effects, 27.

trace element deficiencies, multiple, 509.

variety comparisons, agrobiologic test for normality in, 173.

yield-depression effects of fertilizers, 27.

yields and fertilizer use, bibliography, 790.

yields, effect of sources of nitrogen, 786.

Cropland use in war and peace, U.S.D.A. 581.

Crops and Markets—

January 1946, U.S.D.A. 264.

April 1946, U.S.D.A. 585.

Crotalaria spectabilis, cause of poisoning in Louisiana livestock, 241.

Crucibles, Sela filtering, reverse-flow washing, 10.

Crucifer extracts, toxicity to *Colletotrichum circinans*, effect of pH, 821.

Cryolite—

copper-fungicide compatibility with, 80.

dust—

control of sugarcane borer, 360.

diluent, alkaline, 352.

Cryptostegia—

grandiflora—

latex flow, influence of time of day, 491.

morphology and anatomy, U.S.D.A. 796.

rubber from leaf latex of, 162.

non-latex rubber content, 796.

Cryptotermes brevis—see Polilla.

Cuba, insect and other arthropod pests, catalog, 532.

Cuban-laurel thrips, control on *Ficus benjamina*, 836.

Cucumber—

anthracnose control, 334, 336.

anthracnose, control by Fermate, 827.

downy mildew resistant, development, S.C. 815.

hybrid, seed, production by honeybee pollination, 370.

Cucurbits—

aphid-resistance, test, 81.

downy mildew resistance, test, 81.

pickleworm, life history and control, 536.

Culex—

males, identification under low magnification, 540.

quinquefasciatus—see Southern house mosquito.

Culture—

chamber, constant-temperature water bath, 318.

media, agar, gas bubbles developing in, 30.

media, stale, effect on fungi and bacteria, 32.

Cunic, control of gastrointestinal helminthiasis in sheep, 564.

Cuproammonium, cellulose dispersions, fluidity values, calculation, 138.

Curly top of beans, relation to beet leafhopper selection of bean varieties, 833.

Currants, black, vitamin C content, as influenced by cold processing, 137.

Current Farm Economics—

February 1946, Okla. 264.

April 1946, Okla. 402.

June-August 1946, Okla. 863.

Curtis, George Washington, and Frank Arthur Gulley, two early agricultural teachers in Texas, 587.

Cuttings—

root formation, leaf role, 35.

rooting of growth-substance-treated, 49.

Cyamopsis tetragonoloba—See Guar.

Cyclones, three, in Mauritius in 1945, effects, 476.

Cyperaceae, *Sclerotinia* spp. on, 33.

Cyperus esculentus, food and feed uses and general information, Fla. 192.

Cysticercus bovis, thermal death point, 387.

Cystine content of plant and animal material, determination by differential oxidation procedure, 773.

Cytogene, mendelian segregation, phenomenon of dominance, 493.

Cytology, animal, book, 41.

2, 4-D—see also 2, 4-Dichlorophenoxyacetic acid.

control of—

ragweed with care around crop plants, N.Y. State and Cornell 814.

weeds, N.J. 504.

weeds in canning peas, Mich. 49.

weeds in Colorado, 329.

weeds on sugarcane lands, U.S.D.A. 811.

weeds, period of effectiveness, 813.

effects on ragweed and certain woody plants, Mich. 664.

D-D mixture for wireworm control, 82.

DDT—

action in cockroach, site, 227.

action in flies, site, 530.

aerosol, non-volatile content, effect on house flies, 840.

DDT—Continued

aerosols, efficacy against common malaria mosquito and housefly, 541.
 airplane spraying—
 for control of adult mosquitoes in open, unwooded areas, 368.
 of rice fields for mosquito larvae, 87.
 and derivatives, physical properties, 357.
 and lead-arsenate-phenothiazine sprays, Pa. 531.
 and related compounds, stability, 467.
 bromine analogs, 466.
 budbugs exposed to, effect of temperature, 227.
 compatibility with insecticides, fungicides, and fertilizers, 223.
 compounds, toxicity to houseflies, comparison with pyrethrum, 229.
 control of—
 adult mosquitoes, outdoors, applied with ground equipment, 368.
 American dog tick, vector of Rocky Mountain spotted fever, preliminary tests, 701.
 apple blossom insects, 225.
 bugs causing deformed peaches, 537.
 cauliflower worms on Long Island, 691.
 chicken lice, 88.
 codling moth in Colorado, Colo. 693.
 codling moth in Virginia 356.
 codling moth in western New York, N.Y. State and Cornell 362.
 codling moth in western New York in 1945, 694.
 filter fly in sewage, 697, 698.
 fire ant, 696.
 flies in dairy barns, 366.
 flies in dairy barns, N.Y. State and Cornell 840.
 Gulf Coast ticks on range cattle in Florida, 542.
 halry chinch bug, 883.
 hide beetles, 837.
 horn fly in Kansas, 542.
 horn fly on range cattle in Florida, 542.
 household and stored grain insects, 539.
 immature squash bugs, 693.
 insects affecting livestock, 839.
 insects affecting man, 840.
 insects in canning industry, 85.
 insects, in dairy barns, 366.
 insects in fishery industries, 85.
 insects of livestock, poultry, household, garden, and fruits, Mo. 833.
 mosquitoes, 866.
 northern feather mite, *Liponyssus sylviarum*, 544.
 onion thrips, Ohio, 361.
 oriental fruit moth, comparison with Ryanex, 694.
 oriental fruit moth on peaches, 695, 834.
 potato aphids in New York, 690.
 potato aphids in northeastern Maine, 690.
 roaches, formula improved by "Lethane A-70", 697.

DDT—Continued

control of—continued
 sarcoptic mange, 887.
 sheep tick, *Ixodes ricinus*, 701.
 Simulium larvae, 88.
 dehydrochlorination of substituted 2, 2-diphenyl-chloroethanes related to, kinetic study, 9.
 determination, colorimetric method—
 color test for related compounds, 805.
 description, 804.
 dispersion from fast aircraft, 79.
 dust, control of anthracnose and leafhoppers on snap beans, Mich. 360.
 dust, dosage tests on vegetable pests, 352.
 effect on—
 aster yellows, 357.
 cabbage maggot of radish, 357.
 cutaneous sensations in man, 685.
 fish and wildlife, 530.
 leaf hopper on head lettuce, 357.
 potato insect pests, N. Dak. 211.
 stem rust reaction of Khapl wheat, 342.
 yeast fermentation, 223.
 efficacy against scab mites on laboratory rabbits, 369.
 emulsion, application to rice-field water for control of mosquitoes, 540.
 eradication of swine louse *Haematopinus suis* by single treatment, 543.
 excretion in man, clinical observations, 223.
 fabrics impregnated with, effect on insects, 85.
 in quick-breaking fuel-oil emulsions, 358.
 in spray residues and insecticide mixtures, analysis, 778.
 in technical and pure compounds, determination by total chlorine procedures, 778.
 in veterinary medicine, 389.
 inefficacy against—
 apple mite, 225.
 pea aphid, 692, 693.
 insecticidal aerosols containing, accelerated aging test, 778.
 insecticides, more research needed, N.Y. State and Cornell 358.
 intelligent use in horticulture, 833.
 kerosene solutions, penetration prevented by aluminum stearate, 79.
 large-scale application by thermal aerosol fog generator, 684.
 mosquitoes exposed to, effect of temperature, 227.
 optical crystallographic properties of purified single isomer, 8.
 pest control research, progress in cooperative project, 79.
 potato insecticide in 1945, results in six States, summary, 689.
 present status as insecticide, 529.
 quantitative estimation in sample, 305.
 removal from water supplies, 224.
 residual sprays, use in home, 883.

DDT—Continued

- residual-type sprays, effects of light, 529.
- residues on fruits and vegetables, Mich. 61.
- resistance of bedbugs, biological factors, 365.
- sensitivity, correlation with possession of chitinous cuticle, 529.
- significance in agriculture, 528.
- soil application, efficacy of protection of plants from black beetle, 531.
- spray, or dust deposits, quantitative estimation, 305.
- sprays and European red mite populations, 77.
- sym*-tetraphenylethane from related compounds and, 9.
- technical, chemical composition, 8.
- technical, determination of 1-trichloro-2, 2-bis (*p*-chlorophenyl) ethane in, 305.
- thermal aerosol fogs for clothes moths in wool storage warehouse, 697.
- threat to bees, N.C. 702.
- toxicity to—
 - animals, 529.
 - domestic and laboratory animals, 86.
 - man, 531.
- use—
 - against codling moth, precaution, 694.
 - against insect pests of soft fruits, 363.
 - as agricultural insecticide, trials, 1944-45, 357.
 - at farmstead, evaluation, Minn. 531.
 - for Murine typhus control in Southwest, 358.
 - in agriculture, 357.
 - in medicine, review, 854.
 - in Tulare County, 225.
 - value as agricultural insecticide, 223.

DDT-rotenone spray, control of cattle ticks in tropical regions, 543.

Dairy—

- bacteriology, papers, abstracts, 713.
- cattle—*see* Cattle, dairy.
- farming, analysis, Putnam County, Georgia, 1944, Ga. 261.
- farms, management, Putnam County, Georgia, 1944, Ga. 261.
- herds, brucellosis control and its relation to milk supply, 716.
- herd, Calhoun, high average production, La. 238.
- industry—
 - development and economics in Mississippi, Miss. 114.
 - quality control in, 121.
 - scientific advances, review of literature, 1945, 552.
 - sterilization methods, 99.
- products—
 - biotin content, microbiological assay, 20.
 - choline content, microbiological assay, 20.
 - marketing adjustments in Michigan, Mich. 115.

Dairy—Continued

- products—continued
 - pasteurization, 239.
 - research progress reports, U.S.D.A. 97.
 - sterilization methods, 99.
 - rations, grain mixtures, simple vs. complex, II, summer feeding milk cows on pasture, Ohio 381.
 - rations, grain mixtures, simple vs. complex, III, IV, Ohio 849.
 - Research Digest, 1946, La. 848.
 - science, progress, review, Sec. A, physiology of dairy cattle, I, reproduction and lactation, 552.
- Dairy Industry, Bureau of, report of Chief, 1945, U.S.D.A. 42, 140, 141.
- Dairying—
 - insect control, 840.
 - research progress reports, U.S.D.A. 97, 140, Ala. 143.
- Dandelion—
 - control with 2, 4-D, Wyo. 505.
 - Russian—*see also* Kok-saghyz; *Taraxacum kok-saghyz*.
 - content in live roots, estimation, 184.
 - latex-tube areas of roots and leaves, U.S.D.A. 493.
- Date, Deglet Noor—
 - fruits, checking, relation to water deficit, U.S.D.A. 203.
 - leaf elongation and fruit growth, relation to soil-moisture deficiency, U.S.D.A. 203.
- Dates, composition, changes during growth and ripening, U.S.D.A. 204.
- Datura stramonium*, Duvel buried seed experiment, U.S.D.A. 201.
- Deer, Columbian black-tailed, parasites, diseases, injuries, and anomalies in British Columbia, 682.
- Degras, cholesterol separation from, 156.
- Degreasing solvents, compositions and trade names, 140.
- Dehydration—
 - control, peroxidase aids, quick test, 271.
 - fruits, new methods, 270.
 - kale, 270.
 - small fruits, 123.
 - vegetables, varietal suitability, 122.
- Dehydrators, farm, mechanical features, 110.
- Dehydroascorbic acid, excretion in sweat and urine under different environmental conditions, 740.
- 7-Dehydrocholesterol (D3) antirachitic potency for growing pigs, 376.
- Dehydrofreezing, new method of preserving food, 879.
- Delaware Station report, 1945, Del. 900.
- Deleaster dichrous*, European staphylinid, occurrence in North America, 354.
- Demand, intraseasonal, determination, 724.
- Dendrochronology, researches, 770.
- Denmark, plant diseases and pests, 670.
- Densitometer for GR-S lattices, description and use, 767.
- Dermanyssus gallinae*—*see* Chicken mite.

- Dermatological condition in animals, acid-ester remedy, 387.
- Dermatosis, flarial, of sheep, treatment with antimony compounds, 856.
- Derris—
 combination with high-boiling-point tar acids, effectiveness against body lice, 543.
 comparison, toxicological, with *Lonchocarpus*, 832.
- elliptica*—
 clones, evaluation, 798.
 composition, effects of altitude and water supply, 794.
 rotenone test applied to, 14.
- Desthiobiotin in biosynthesis of biotin, 615.
- d*, *l*-Desthiobiotin, synthetic, biological activity, 184.
- Devils shoestring, rotenone-bearing, response to fertilizer applications, 807.
- Dewberries, summer care, Miss. 817.
- Dextran, from sucrose, enzymatic synthesis, 765.
- Dextral-maltose, nutritive value, determination by single-food choice method, 419.
- Dextrose—
 assay by copper reduction method, 15.
 nutritive value vs. sucrose, in rats, 136.
 utilization, influence of thiamine in rats, 136.
- Diabrotica*—
duodecimpunctata—see Southern corn root-worm.
 spp., corn pests in Nebraska, 83.
- Diacyl—
 determination in tissue and bacterial filtrates, direct, method, 473.
 production by betacocci in milk, effect of acidity, 554.
- Diamondback moth, rotenone-dust, effects, 80.
- Dichloroacetic acid, in food products, detection and assay, 16.
- 2, 4-Dichlorophenoxyacetic acid—see also 2, 4-D.
 effect on germination and development of seedlings, 320.
 effect on water relations, solid matter, and respiration of bean plants, 320.
 feed containing, tolerance of farm animals to, 558.
 stimulus, movement and relation to translocation of organic food materials, 320.
 use for improvement of greenhouse tomatoes, Mich. 331.
- 1, 2-Dichloropropane-1, 3-dichloropropene mixture—see D-D mixture.
- Dictionary of fungi, 815.
- Dictyostellium discoideum*, morphogenic-movement rate, 38.
- Diesel gas engine, producer gas application to, 162.
- Dietary—
 factors, guinea pig requirements, 188.
 habits of Cornell University women, 885.
 level of 100 families, 274.
- Diet(s)—
 caloric value, Atwater system of calculation, 130.
 improvement by use of wheat substitutes and green vegetables, Miss. 886.
 of aircraft workers in southern California, I-IV, 418.
 protein-free compounded with amino acids, proteins added, growth stimulating action, 591.
 protein level, effect on vitamin A utilization, by rats, 133.
- Digester, rotary, for wood saccharification, 22.
- Digestibility, apparent, coefficients, estimation by inert "reference-substance," 703.
- Dilodotyrosine, formation of thyroxine from, effect of experimental conditions, 449.
- Dimethylaminoethanol—
 choline relation to, 94.
 in chick rations, 549.
 choline-like effect, 94.
- Dimethylglyoxime-copper treatment for rot-proofing fabrics, 900.
- Dinitro compounds, toxic action on honey-bee, 702.
- 2, 4-Dinitroanilines, N-substituted, in codling moth larval control, 77.
- Dinitro-*o*-cresol, fungistatic activity, effect of pH, 207.
- 4, 6-Dinitro-*o*-cresol, for codling moth larvae control, 77.
- Dinoflagellate, new parasitic, from freshwater fish, 351.
- 2, 2-Diphenylchloroethanes, dehydrochlorination of substituted DDT-related, kinetic study, 9.
- Diphtheroids, isolation from apparently normal cows, 717.
- Diplodia—
 rot of onions, 344.
theobromae, cause of die-back of guayule, 680.
zeae, spore production and germination in culture, 65.
- Directory of agricultural periodicals, societies, experiment stations, and schools in Latin America, 911.
- Disaccharide, enzymically synthesized crystalline, isolation and structure, 4.
- Diseases—see under Animal(s); Fruit(s); Plant(s); Vegetable(s); also *specific hosts and names*.
- Disinfectants for—
 greenhouse soils, 61.
 institutional equipment, 126.
- Disinfection, by phenol, temperature coefficient of reaction by new technique, 101.
- Disodium ethylene bisdithiocarbamate—see Dithane.
- Distemper, canine, control by distemperoid virus, 395.
- Distillers' byproducts—
 in dry calf starters with limited quantities of milk, Nebr. 287.

- Distillers' byproducts—Continued
in poultry breeding diets, 94.
nutritive value as source of protein, 231.
- Dithane—
control of Mexican bean beetle, 81.
use on soil for control of insect pests of plants, 352.
- Ditylenchus destructor*, 1945 potato-rot nematode in Prince Edward Island, 212.
- Doassansia hygrophilae* n. sp., nuclear cycle and life history, 509.
- Dodder, stem tips, excised, cultivation in vitro, 488.
- Dodders, reaction to stems of other dodders and to their own stems, 336.
- Dog(s)—
absorption and excretion of calcium pantothenate, 601.
anomalous posterior vena cava, 387.
blood plasma, determination of free leucine, isoleucine, valine, and threonine, 618.
Collie breeds, differences, 44.
distemper, control by distemperoid virus, 395.
English Setter, bicolor gene in, genetic analysis, 44.
enteric infections, sulfathalidine treatment, 248.
food, fat-producing, further tests, 387.
hysteria due to feeding baked foods and wheat gluten flour, 234.
neoplastic lymphadenopathies in, 105.
nicotinic acid requirements, 135.
potassium deficiency, 395.
proteins, biological value, relation to absorbed nitrogen and nitrogen balance, 592.
pyridoxine-deficient and normal, fate of tryptophan in, 601.
streptomycin absorption and excretion, preliminary studies, 248.
systemic blastomycosis, 387.
- Dogwood borer, biology and control, 352.
- Dolichos lablab*, parasitism of *Striga* sp. on, 518.
- Dominican Republic, coffee, 507.
- Dough(s)—see also Bread.
freezing before baking, 124.
gluten disintegration, effects of papain, yeast water, cysteine, and glutathione, indications, 609.
gluten dispersion, effects of papain, yeast water, cysteine, and glutathione, indication, 609.
mixogram patterns, effect of fermentation, rest periods, and formula ingredients, 307.
oxidizing agents, 297.
- Doves, species-specific antigens, segregation in backcross of species hybrids, 188.
- Dragonflies, economic importance, 538.
- Drier(s)—
experimental, for pre-pilot plant studies, 770.
hay, flatted floor barn, handbook on design, 862.
- Drought, effect on trees in prairie climate, 167.
- Drug(s)—
antimalarial, studies in vitro, 241.
inspection and analysis reports, Conn. [New Haven] 122.
plants—
of Mexico, book, 181.
tests for Puerto Rican culture, P.R.U. 55.
- Dry-cleaning solvents, compositions and trade names, 140.
- Duck(s)—
blood, oxygen transport, 710.
disease at Tulare Lake, 253.
food at Reelfoot Lake, Tenn., 523.
infected with *Plasmodium lophurae*, continuous intravenous chemotherapy, 251.
nesting boxes, wood, use in Wheeler Wildlife Refuge, Tenn., 523.
nutritional studies, I, purified rations, 419.
nutritional studies, II, pyridoxine deficiency, 420.
wild, pasteurellosis outbreak, 398.
wild, pasteurellosis treatment, 398.
- Duckling(s)—
intracerebral passage of modification of strain of Newcastle disease virus, preliminary, 721.
vitamin D requirements, 552.
- Dunes, soil material, 479.
- Dust(s)—
control of hairy chinch bug, 833.
diluent, diatomaceous, 688.
for potato—
demonstration plots, 1945, 211.
early blight fungus, evaluation, N. Dak. 211.
insect pests, evaluation, N. Dak. 211.
new, in control of insects and diseases, 355.
rotenone, toxicity, effect of mineral composition and particle size in dispersants, 832.
zinc-bearing, trials, 821.
- Dusters for apple scab control, 827.
- Dusting—
orchards by airplane, 72.
sugarcane borer with cryolite, 360.
- Duvel buried seed experiment, final results, U.S.D.A. 201.
- Dye(s)—
employed in biological laboratory, nature and uses, handbook, 778.
sulfate-reducing bacteria inhibited by, 82.
titration for ascorbic acid, specificity, 602.

- "Dyne," new dairy product, 852.
 Dystocia in cows from uterine torsion, instrument for relieving, 100.
 East coast fever—*see also* African coast fever.
 in cattle, spread by *Rhipicephalus neavei*, 1912, 280.
 Economic—
 and cultural development of people in Virginia, 587.
 outlook in Sumter, S.C., S.C. 865.
 Economics—
 agricultural—
 papers, 578.
 papers and notes, 579.
 postwar problems and programs in Nebraska, committee reports listed, Nebr. 111.
 research by experiment stations, progress reports (1945), U.S.D.A. 142.
 research progress report, Ohio 110, U.S.D.A. 140, 141, Ala. 143.
 home—*see* Home economics.
 Ecuador—
 agriculture and war, U.S.D.A. 263.
 forests, effects of war and postwar conditions, 334.
 Sierra, eucalyptus planting, U.S.D.A. 206.
 Edgegrowth, relation to crop yield and insect damage, Va. 685.
 Education—
 higher agricultural, in England and Wales, 410.
 home-economics, needs and program, 120.
 rural, and welfare in Middle East, report, 876.
 rural, postwar problems and programs in Nebraska, committee reports listed, Nebr. 111.
 white population in Louisiana, rural-urban differences, 875.
 Helworm cyst, ecology, 514.
 Egg(s)—
 and milk dehydrated mixtures, keeping quality, 415.
 blood spots, incidence and relation to first year mortality, 858.
 carriers of *Salmonella pullorum*, 252.
 cooling on ranch by mechanical refrigeration, 258.
 dehydrated—
 carotenoid content, determination, 775.
 lipid amine-aldehyde product content, determination, 775.
 vapor pressure of water absorbed on, 161.
 vitamin content, 423.
 dried—
 powders, free from fatty acids, estimation, factors influencing, 774.
 stored, fluorescence source in, 161.
 whole, vitamin A, chemical determination, 775.
 hatchability increase, effectiveness of dietary supplements to soybean oil meal, 547.
 Egg(s)—Continued
 hen, prematurely ovulated, fertility and hatchability, 801.
 incubation temperatures, effect on character expression in fowls, 18a.
 laid by turkeys infected with *Salmonella typhimurium*, bacteriological examination, 252.
 laying—
 cages, feeding and management in. N. Mex. 706.
 effects of hypothermia, 653.
 house, utilization, Mich. 705.
 marketing practices, West Virginia, W. Va. 263.
 pantothenic acid content, effect on amount in newly hatched chicks, 378.
 powder, dried whole. XVI-XIX, 415.
 processing, effect on biological value, Iowa 887.
 production—
 and hatchability, as influenced by cow-manure feeding, 95.
 artificial control, N.Y. State and Cornell 379.
 efficiency, effect of diet, 547.
 lighting effects, Wash. 705.
 of late-hatched White Leghorn pullets, effect of artificial light, N. Dak. 379.
 per man hour, increase, N.Y. State and Cornell 870.
 research progress reports, U.S.D.A. 121.
 riboflavin assay in, fluorometric method, 160.
 Salmonella isolation, 252.
 shell thickness—
 and porosity, relationship, 708.
 influence of levels of dietary calcium, 708.
 storage cabinet, water cooled, Nebr. 259.
 vitamin A in dehydrated, spectro-chemical determination method, 157.
 weights, R.O.P., obtaining, short period, 236.
 whites and yolks, content, effect of riboflavin intake, 708.
 yolk lipoprotein, lipovitellin, preparation, 609.
 Egg-albumin detergent complex, structure, 450.
 Egg-laying tests in New Jersey, 1916-43, N.J. 378.
 Eggplants—
 infestation by *Keiseria penicula* n. sp., 225.
 phomopsis fruit rot, control, N.J. 676.
 Eimeria—
 stiedae, dosage related to severity of liver coccidiosis, 387.
 tenella—
 in chickens, effect of sulfaguanidine on course of infection, 397.
 infections of chicken, activity of sulfanilamides, 387.
 oocysts, production, delayed, factor, 860.
Elaeagnus angustifolia, new disease of unknown cause, 73.

- Elateridae, birds eating in Utah, 77.
 Electric welding, economy on cost of steel building frames, Wis. 400.
 Electricity, handbook, 108.
 Election, rural, Kansas a pioneer, Kan 875.
 Electrodes, membrane, uses and limitations, 468.
 Electron micrographs of crystalline plant viruses, 468.
 Electron microscopy, shadow-casting technique, 757.
 Electronics—
 blanching by, 125.
 in food processing, new principles involved, 272.
 mold destruction by, 126.
 Electroviscosity data, meaning of $k\phi$ values, interpretation, 467.
 Elements, radioactive, root absorption shown by, 86.
 α -Eleostearic acid in freshly extracted tung oil, spectrophotometric determination, 302.
 Elevators, farmer-owned, financial operations, Ohio, 1944-45, Ohio 409.
 Elm, American, phloem necrosis, distribution, 335.
Elodea protoplasm, structural viscosity, effects of various agents, 323.
Elasnoö—
 patri, identity and distribution in Washington and Oregon, 516.
 sp., undescribed, from Mysore, 336.
Elymus—
 hybrids, artificial and natural, 798.
 Sitanion, and *Agropyron* hybrids, artificial and natural, 648.
 × wheat × rye, trigenic hybrids, 649.
 Employment, postwar opportunities in agricultural community, S.C. 865.
Empoasca leafhopper, cause of papaya bunchy top, 217.
 Encephalitis—
 equine, Japanese sera, antibodies, 247.
 human, of western equine type in Minnesota, 1941, serologically positive cases, 389.
 virus Japanese B, in blood of experimentally inoculated chickens, 367.
 virus, St. Louis strain, congenital transfer in chicken mites, 101.
 Encephalomalacia, nutritional, in chicks, field case, 396.
 Encephalomyelitis—
 virus, in water buffaloes in China, 104.
 western equine experimental, influence of anesthesia, 719.
 Endemism, narrow, edaphic factor, I, nature of environmental influences, 792.
 Endocarditis, subacute bacterial, association with *Streptococcus* s. b. e. strains, 790.
 Endocarditis, subacute bacterial, streptococci isolated, classification, 791.
 Engineering, agricultural—
 in Colorado, Colo. 253.
 Engineering, agricultural—Continued
 research progress reports, U.S.D.A. 140, 141, 142, Ala. 143.
 Engineers, agricultural, training for today's challenge, 253.
 Engines—
 automotive, nonpetroleum fuels for, 108.
 internal-combustion, producer gas application to, 162.
 Enteritis, treatment with sulfathalidine, 387.
 Enterotoxemia(s)—
 in lambs—
 control by alum-precipitated toxoid, 855.
 treatment by sulfur, Colo. 856.
 ovine infectious, in Colombia, 104.
 Entomology—
 economic, research involvements, 532.
 future of, 77.
 in cereal industries, 85.
 nomenclature and literature, new edition, 532.
 research by experiment stations, progress reports (1945), U.S.D.A. 142.
 research progress reports, U.S.D.A. 140, 141, 142, Ala. 143.
 Entomology and Plant Quarantine, Bureau of, report of Chief (1945), U.S.D.A. 140, 141.
Entomyscus fragilis n. sp., description, 369.
 Environment, factors and control in plant experiments, 781.
 Enzymatic synthesis of dextran from sucrose, 765.
 Enzyme(s)—
 bacterial, extraction by ultrasonic disintegration, 634.
 effect on penicillin, 32.
 light-sensitive, in milk, 239.
 pectinol A, effect on pectin and other substances, 5.
 proteolytic, effect on raw and heated casein, 449.
 relationships in utilization of soybean oil meal phosphorus by rat, 596.
 role in wheat technology, volume, 762.
 Enzymology, advances, and related subjects of biochemistry, VI, volume, 762.
Fomenacanthus stramineus—see Chicken body louse.
 Ephemoptera, new species, 830.
Epilachna varivestis—see Mexican bean beetle.
Eptone mollicularia, descriptive and taxonomic notes, 80.
Eptirix tubercis—see Tuber flea beetle.
Epourenia viva n. gen. and sp., description, 686.
 Epoxides, in food-spoilage prevention, 126.
Erechthias fulguritella in pine cones, 226.
 Ergosterol, irradiated (D2), antirachitic potency for growing pigs, 376.
 Erosion—
 control and reclamation of eroded sandy clay lands of Texas, Arkansas, and Louisiana, U.S.D.A. 631.

Erosion—Continued

- soil—
 - bambo controlling, 26.
 - book, 26.
 - early investigations, 785.
 - effects of pocket gopher on mountain range, 349.
 - in central New York, [N.Y.] Cornell 311.
 - in small irrigation furrows, Utah, 570.
- wind, dynamics—
 - III–V, 172.
 - VI, sorting of soil material by wind, 479.

Erysipelae—see host.

Erysipelothrix rhusiopathiae infections in mice, chemotherapy, 389.

Erysiphaceae of China, further studies, 209.

Erysiphe—

- new variety in China, 209.
- polygoni*, cause of powdery mildew of broad bean in Yunnan, China, 337.
- spp. conidial germination, mechanism, 61.

Erythroleucosis, incidence following inoculation by various routes, 567.

Erythroneura of obliqua group from Ohio and Tennessee, 221.

Erythroneura of vulnerata group, keys and one species, 353.

Escherichia coli, sensitivity to radiation, inherited differences, 651.

Estrogens—see also Hormones, estrogenic. effect on meat quality of old cocks and hens, 709.

feeding, fattening potency in chicks, rapid assay method, 46.

synthetic, activity on oral administration in domestic fowl and turkey, 234.

synthetic, capon production, 190.

Estrus, induction—

- by equine gonadotropin in lactating sows, 46.

in ovariectomized hamster, 189.

Ethane, 1,1,1-trichloro-2, 2-bis (*p*-chlorophenyl)—see DDT.

Ethyl formate, fumigant for dried packaged fruit, 77.

Ethylene dibromide—

- as fumigant for Japanese beetle, 77.
- wireworm control by, 82.

2-Ethylhexanediol-1, 3, insect-repellent properties, 79.

Eucalyptus, planting in Ecuador Sierra, U.S.D.A. 206.

Eufidonia larvae, new descriptions, 364.

Euhomogamasus sciuropteri n. sp. from squirrel, 369.

Eulithobius, new species, description, 351.

Euphorbia calycina, insecticidal properties of extracts, 80.

Euphorbia tirucalli, insecticidal properties of extracts, 80.

Euphorbiaceae, seed development, 797.

Euphiloides, new oriental subgenus of *Crossoerus*, with descriptions of new species and subspecies, 355.

European—

apple sawfly in Connecticut, 352.

chafer, *Amphimallon majalis*, and control in lawns, 696.

corn borer—

- control by low-temperature fumigation, 356.

tachinid parasite, 83.

red mite—

- DDT sprays and populations, 77.
- life history, Va. 835.

Euschistus impictiventris, damage to sugar beets grown for seed, 834.

Euschistus spp., life history, 695.

Eutrichophilus spp. on rodents, descriptions, 88.

Eutrombicula batatas, habits and life history, 544.

Evaporation regions in United States, 475

Ewes—

aneestrous, induction of mating and lambing following pregnant mare serum administration, 801.

breeding—

nutritive needs, 91, Idaho 92.

wintering in Alaska, Alaska 92.

colostrum, vitamin contents, 98.

ketonemia in fetus of, 100.

pregnant, blood glucose and acetone bodies, influence of protein starch diets, 375.

Experiment stations—see also specific names. workers in subjects pertaining to agriculture, 1945–46, U.S.D.A. 875.

Office of—

eleventh annual survey, 265.

notes, 447, 759, 912.

report of Chief (1945), U.S.D.A. 141, 142.

report on agricultural experiment stations (1945), U.S.D.A. 142.

Experimental techniques, agrobiological test for normality in fertilizer and variety comparisons, 173.

Experimental techniques, block designs for insect population problems, 77.

Extension—

methods and techniques, contribution to rehabilitation of war-torn countries, conference report, 1944, U.S.D.A. 265.

work, cooperative, in agriculture and home economics, report, 1945, U.S.D.A. 734.

workers, radio handbook for, U.S.D.A. 121.

Extensograph, preliminary studies, 291.

Extractor, for atmospheric or reduced pressure use, 149.

Eyes, biomicroscopy in evaluation of nutritional status, 427.

Fabrics—see also Textiles; specific kinds.

action of antiperspirant creams, 899.

cellulose, flow properties of cuprammonium dispersions, fluidity calculations, 188.

DDT-impregnated, effect on insects, 85.

flameproofing, durable, for cotton outer garments, 434.

flammability, basis of evaluation, 434.

Fabrics—Continued

- knitted, made of natural and mercerized carded and combed cotton yarns, physical properties, 433.
- lining, abrasion, 484.
- pest deterrents, evaluation, 435.
- research progress reports, U.S.D.A. 141, 142.
- resistance to insect pests, increase, compounds for, valuation, 435.
- rotproofing, dimethylgloxime-copper treatment, 900.
- waterproof, tests, devices for producing artificial rainfall, 750.

Fall cankerworm, egg parasitism, 352.

Family(ies)—

- dietary level of 100, study, 274.
- farm, incomes and living costs in Kansas, Kans. 139.
- food selection of 80 in Lubbock, Texas, further analysis, 275.

Fanweed seed, concentrate for milk cows, Mont. 849.

Far East, war damage, report, 608.

Farm(s)—see also specific kinds.

- business report (1944), Mich. 111.
- family-operated, typical, 1930-45, adjustments, costs, and returns, U.S.D.A. 582.
- historical look to future, U.S.D.A. 583.

Income(s)—

- and living costs in Kansas, Kans. 139.
- and national income, 724.
- index numbers (1945), Ohio 110.
- postwar, U.S.D.A. 110.
- report (1944), Mich. 111.

Job analysis, result in labor saving, II, hay harvesting, Vt. 728.

land—see Land(s); Real estate.

machinery—see Machinery.

management in Oneida County, N.Y., 1942-43, [N.Y.] Cornell 403.

organization—

- and management, teaching, 410.
- and practices, Michigan, type-of-farming area 9, Mich. 260.

economic functions and units, 724.

ownership, financing under Bankhead-Jones Farm Tenant Act, La. 116.

paying for, data for instructors, 583.

plan, development, forms for teaching, 410.

population prospects of Minnesota, Minn. 586.

production—

- farm disposition, and value of principal crops, 1944-45, U.S.D.A. 585.
- in war and peace, U.S.D.A. 259.

products—see Agricultural products.

science and practice, report, 1944, Ohio 752.

size, effect on efficiency of operation and on returns, San Joaquin Valley, Calif., U.S.D.A. 864.

small, economy in Wisconsin, 728.

structures, program, needs, 257.

Farm(s)—Continued

tenancy in U.S., 1940-45, list of references, U.S.D.A. 868.

Farm and Home Science—

June 1946, Utah 757.

March 1946, Utah 444.

Farm Credit Administration, twelfth annual report, 1944-45, 406.

Farm Research, April 1946, N.Y. State and Cornell 444.

Farm Security Administration—

borrowers, outlook vs. views of large-scale operators, Wash. 867.

program of services, U.S.D.A. 118.

Farmer(s)—

cooperation in meeting emergency labor needs during war, Mich. 732.

cooperatives—see Cooperative(s).

in modern world, 863.

income, gross cash, from sale of produce and from A.A.A. payments, in Ohio, 1943-44, Ohio 405.

low-income, program of services to, U.S.D.A. 118.

of Finnish heritage in Michigan, general survey, Mich. 118.

postwar purchase and improvement plans, Md. 731.

price control stake of, W.Va. 118.

subsistence, war relocation, Ohio 732.

Farmhouses, midwestern modernizing, Iowa 110.

Farming—see also specific kind.

capital needed for, in Midwest U.S.A., Minn. 117.

cash receipts, by States and commodities, calendar years 1924-44, U.S.D.A. 585.

changes in war and peace, U.S.D.A. 863.

dairy—see Dairy farm(s); Dairy farming.

opportunities, improvement by agricultural adjustment, S.C. 865.

peacetime adjustments, 403.

practices, Michigan, type-of-farming area 9, Mich. 260.

scale, economies in southern San Joaquin Valley, Calif., U.S.D.A. 864.

southern, facts, U.S.D.A. 261.

systems and practices, red soil area, Tennessee, 1944, Tenn. 728.

Farmstead—

lighting, planning, U.S.D.A. 257.

wiring, planning, U.S.D.A. 257.

Fasciola hepatica—see Common liver fluke.

metacercariae, ecology, 867.

Fat(s)—see also specific kinds.

acids—see Fatty acids.

antioxidants, evaluation by stability values obtained by rapid methods, 471.

antioxidants, fatty acid monoesters of L-ascorbic and d-isoascorbic acids, 462.

chlorophyll content, fluorescence, relation to rancidity, 453.

comparative nutrient values of butterfat vs. margarine, 129.

deterioration, problems of Army, 418.

Fat(s)—Continued

dilatometric investigations, I, II, 452.
 effect on resistance of rats to anoxic anoxia, 739.
 effect on utilization of galactose by rat, 422, 454.
 esters, unsaturated, peroxides, formation and decomposition, 462.
 fatty acid monoesters of *l*-ascorbic and *d*-isoascorbic acids in, assay, 19.
 food, flavors in, 121.
 hog, stability, relation to fatty acid composition and tocopherol contents, 627.
 in cereal products, oxidative deterioration, 266.
 in wheat starch, extraction, 3.
 metabolism, effect of B vitamins, tests with choline, 594.
 of poor keeping quality, stabilizing agents, 460.
 oxidized, stabilization by steam deodorization with phosphatic acid or commercial lecithin, 453.
 oxygen absorption, rate, determination apparatus, 299.
 rancid, toxicity, 266, 389.
 stability values, active oxygen method and storage in glass vials, 453.
 thermal properties, I-V, 455.
 thiocyanogen reagent and method, modified, 472.
 vegetable, plastic, consistency measurement by standard micro-penetration technique, 455.

Fatty acid(s)—
 chain length, effect on fatty liver of choline deficiency in rats, 129.
 components of soybean lecithin, 465.
 composition of—
 linseed oil, relation to iodine number, 463.
 soybean oil, relation to iodine number, 460.
 tobacco seed oils, 461.
 distribution pattern in glycerides of milk fat, 384.
 free, in dried egg powders, estimation, factors influencing, 774.
 higher, acyl phosphates, synthesis and properties, 464.
 methyl esters—
 oxygen absorption, and effect of antioxidants, 464.
 vapor pressures, 5.
 monoesters of *l*-ascorbic and *d*-isoascorbic acid as antioxidants for fats and oils, 462.
 of corn oil, 295.
 polymeric, allylic esters, 464.
 unsaturated, effect on acid production of *Lactobacillus helveticus*, 553.
 unsaturated, effect on *Lactobacillus helveticus* and other gram-positive microorganisms, 295.
 volatile, in cheese, determination, simplified extraction-distillation method, 774.

Fatty acid(s)—Continued

volatile saturated, separation and identification, 16.
 Fatty materials, mono-unsaturated, hydroxylation with hydrogen peroxide, 294.
 Feces, metallic elements, spectrographic determination, 304.
 Federal Crop Insurance Corporation, report of Manager (1945), U.S.D.A. 117.

Feed(s)—
 animal, digestibility measured by experiments with rats, 275.
 animal, supplement, fused tricalcium phosphate fertilizer, 841.
 cattle, identification and measurement of rate of passage through rumen, 841.
 fattening, for cattle, Ariz. 90, Wash. 91.
 livestock, green feed supplements in, 90.
 low-potency, riboflavin assay, 160.
 pigs, synthetic nutrients added to protein supplements, 93.
 samples, official, analyzed by Kentucky Agricultural Experiment Station, quarterly report, 546.
 sulfur in, assay methods, 20.
 sulfur in, determination by nitric and perchloric acid digestion procedure, 156.

Feedstuffs, apparent digestibility coefficients, estimation by inert "reference-substance," 703.

Fence posts—
 cold-soaking in pentachlorophenol solution, convenient method, 669.
 preservative treatments, Colo. 206.

Fermate, control of cucumber anthracnose, 827.

Fermentation(s)—
 2,3-butylene glycol in, assay technique, 16.
 liquors, cereal, 2,3-butylene glycol recovery from, 164.
 liquors, itaconic acid content, determination, 302.
 media, citric acid assay, 14.

Fertility, differential human, in Louisiana, La. 874.

Fertilization, double, in petunia, 41.

Fertilizer(s)—
 aluminum dress as, 30.
 analyses, checks on methods and solutions, 13.
 application with plow, Minn. 312.
 balanced use by soil tests for potassium and phosphorus, 174.
 bibliography, 1940-44, 781.
 commercial—
 in Colorado, 444.
 inspection, season 1945, Mass. 790.
 report for 1945, Conn. [New Haven] 313.
 effect on crop yields and composition, 173.
 experiments, agrobiologic test for normality in, 173.
 for Utah, 1946, Utah 312.
 inspection, analysis, and use, 1944, 313.

Fertilizer(s)—Continued

- mixtures, ammonium nitrate and organic material in, 80.
- needs of soil, determination by leaf analysis, basis, 321.
- plant foods in, prewar world production and consumption, 482.
- potash determination in, factors influencing, 151.
- recommendations for Mississippi, 1946, Miss. 312.
- research progress reports, U.S.D.A. 140, 142, Ala. 143.
- resources, production, marketing, and use U.S., U.S.D.A. 632.
- sewage sludge (digested) as, 29.
- supplements to high-analysis, 177.
- use and crop yields, bibliography, U.S.D.A. 790.
- yield-depression effects, 27.

Fetal membranes, retained—

- by cattle, blood picture, 854.
- pyometra following, effects of stilbestrol, 392.

Fibers—

- coarse, from proteins, 163.
- cotton, wax determination by alcohol extraction method, 155.
- research progress reports, U.S.D.A. 141, 142.
- textile, from casein, 163.

Ficus benjamini, Cuban-laurel thrips control, 836.

Figs, freezing storage, 882.

Filarial dermatosis of sheep, treatment with antimony compounds, 856.

Filariasis, canine, treatment with trivalent arsenicals, 387.

Filter fly, control by DDT, 697, 698.

Filters, glass bacteriological, arranged for positive pressure, 634.

Fire ant, control by DDT, 696.

Fire, in longleaf-slash pine type, effect on grazing, 57.

Fire, spread in light forest fuels, 56.

Fish(es)—*see also specific kinds*.

- bassallan, parasites, 351.
- condition, calculation from scale dimensions in bluegill, 350.
- detector combined with photoelectric light meter, 525.
- distribution—
 - depth, in lower Wheeler Reservoir, Ala. 526.
 - in Puerto Rican waters, P.R.U. 76.
- fresh-water, new parasite, 351.
- from Michigan waters, nutritive value, I, nicotinic acid of herring, carp, suckers, and burbot, 744.
- liver oil, effect on secretion of vitamin D in mother's milk, 748.
- metacercarial infections, and cercarial production in snails, Carroll Lake, Wis., 351.
- parasites in northern Wisconsin, 77.

Fish(es)—Continued

- species, food in Norris Reservoir, Tenn., 527.
- Fishery industries, insect control in, by DDT, 85.
- Fishing—
 - and marketing in Puerto Rico, general study, P.R.U. 76.
 - spring, effects of water temperature, Norris Reservoir, Tenn., 526.
 - spring, on TVA storage reservoirs, 1945, 526.
- Fishponds, farm, management, Ala. 143.
- Flag smut—*see* Smut, flag.
- Flame weeding, efficacy, N.Y. State and Cornell 401.
- Flameproofing cotton fabrics for outer garments, 434.
- Flammability tester, operating instructions and test procedure, 604.
- Flannagan-Hope Act for Agricultural Research, 447.
- Flat grain beetle, life history and habits, 365.
- Flavin adenine dinucleotide, utilization by *Lactobacillus casei*, influence of riboflavin, 179.
- Flax—
 - choline content, 273.
 - hypocotyledonary buds, development, influence of carbohydrate and nitrate-nitrogen nutrition, 322.
 - seed treatment tests, cooperative, in 1945, 335.
 - seedling disease caused by *Macrosporium* sp., 210.
 - tetraploidy in, 186.
 - wilt fungus, *Fusarium lini*, variation and variability, N.Dak. 210.
 - zinc deficiency in, 66.
- Fleas of Puerto Rico, 229.
- Flies—
 - control by concentrated sprays, 366.
 - control with DDT, 366.
 - locus of action of DDT, 530.
- Flight-vision correlations in insects, 78.
- Flooding, effect on forage crops, 192.
- Floods, notable, of 1939, I Colorado River Basin, II eastern Kentucky, III Baldwin Maine, 475.
- Flora(s)—
 - of Alaska and adjacent Canada, 33.
 - Part V, Cabombaceae to Droseraceae, Iowa 484.
 - of Indiana, distribution records, 34.
 - of Taylor County, Texas, notes, 638.
 - wild and cultivated, of Pennsylvania, catalog, 484.
 - world, history, 181.
- Florida Station—
 - notes, 607.
 - report, 1945, Fla. 901.
- Flour(s)—
 - baking absorption, estimation with effect of variety and protein level, 622.
 - from Missouri wheats for baking purposes, Mo. 411.

Flour(s)—Continued

- gluten, cause of canine hysteria, 234.
- mill, sulfate-reducing bacteria in, treatment, 82.
- new, baking qualities, 876.
- of Kansas-grown wheat varieties, thiamine and riboflavin content, 280.
- wheat, "amylodextrin" fraction, composition, 451.
- white, enrichment, symposium, 876.

Flower(s)—

- development-terminology in bulbous plants, 38.
- gardening, Mo. 205.
- seeds, quality on sale in New York, 1945, N.Y. State 333.
- wild, of Mississippi, popular bulletin, Miss. 180.

Flowering in plants, correlation with nitrogenous food and photoperiod, 185.

"Blue dust," production of sun scald on tomato seedlings, 345.

Fluff louse, control by DDT, 88.

Fluidity values, calculation, 138.

Fluke, new, from badger and other mustelids, description, 522.

Fluoride, determination in water, 300.

Fluorimetry, of pigments by fluorescence intensity, 12.

Fluorine—

- content of soils, 788.
- deposit, injury to apricot leaves, 517.
- in bones and minerals, assay, 19.
- in milk, plant foods, and foods cooked in fluorine-containing water, 273.

Fodder, green, carotene content, vitamin A activity, 545.

Folilage fungicides, gloxalidine derivatives, I, II, 509.

Folic acid—

- compounds, liberation, 616.
 - excretion through skin and in urine of normal individuals, 600.
 - formation by incubating *Lactobacillus casei* factor and pyracin with chick liver, 616.
 - guinea pig requirements, nature of new, 138.
 - importance in low nicotinic-acid rations in dogs, 135.
 - in nutrition of certain insects, 685.
 - synthetic, activity in purified rations, 549.
- Folic acid-like material, microbiologically inactive, vitamin activity in rat, 134.
- Follicle-stimulating hormone, ovarian effects on chicks and hens, 189.

Foods(s)—

- absorption of fluorine from cooking water, 273.
- allotment, national program, 724.
- and dietary habits of Filipinos in Hawaii, Hawaii 734.
- canned—see Canned foods.
- carotene, extraction and assay, 17.
- carotene, values, measurement by storage of vitamin A in rats' livers, 278.
- chemistry, textbook, seventh edition, 410.

Food(s)—Continued

- compression, peacetime, 414.
- consumption levels in U.S., Canada, and United Kingdom, U.S.D.A. 590.
- consumption of albino rat, seasonal changes and rate of growth, 275.
- decomposed, technique of study, 8.
- dehydrated—
 - cooking method, improvement, 589.
 - sulfur dioxide determination in, 155.
- demand, and population growth, U.S.D.A. 119.
- dried, carotene content, effect of storage, 892.
- dry, materials, water content, determination by Fischer volumetric method, 617.
- dry, water determination in, Fischer method, 150.
- effects of soil elements, symposium, 272.
- for young people and their families, book, 418.
- freeze-drying, possibilities, 880.
- freezing—
 - cooked, problems, 880.
 - equipment and processes, N.J. 879.
 - for home use, 123, La. 880.
- from freezer precooked or prepared, 589.
- frozen—see also *specific kinds of foods*; Locker plants.
 - precooked, boon to housewife, N.Y. State and Cornell 880.
 - problems reviewed, 124.
- habits, Hawaiian, war effects, 127.
- home-canned, surface darkening, prevention, 124.
- human, digestibility measured by rats, 275.
- inspection and analysis reports, Conn. [New Haven] 122.
- institutional equipment for, sanitization, 126.
- intake of preschool children, factors influencing, 274.
- investigation, literature, index, 588.
- metallic elements, spectrographic determination, 304.
- methionine determination, 773.
- Mexican—
 - typical composition, 127.
 - vitamin C content, new values, 281.
- nutrients, influence of cooking processes, N.C. 884.
- packaging—
 - for postwar marketing, U.S.D.A. 126.
 - gas penetration rate, determination, 149.
 - gas penetration, rate measurement, 126.
- preparation, changing pattern in small-town families in Mississippi, Miss. 735.
- preparation equipment of small-town families, Miss. 884.
- preservation by dehydrofreezing, new method, 879.
- processing, electronics, new principles involved, 272.
- processors, new germicides, 268.
- products, dichloroacetic acid in, detection and assay, 16.

Food(s)—Continued

- quality and flavor, papers listed, 121.
- research by experiment stations, progress reports (1945), U.S.D.A. 142.
- research progress reports, U.S.D.A. 140, 141, Ala. 143.
- riboflavin assay in low-potency, 160.
- selection of 80 families in Lubbock, Texas, further analysis, 275.
- served in cooperative residence hall for women, ascorbic acid content, 895.
- spillage, and pressure-cooker gauges, 125.
- spillage, prevention by epoxides, 126.
- supply of U.S., nutritive value, 884.
- tropical, representative values, tables, 588.
- tropical, riboflavin content, 745.
- value, estimation by chemical methods in India, 275.
- vitamin B₁ content, extraction procedures for assays, 18.

Food and Agricultural Organization of the United Nations, report of conference (1945), 143.**Foodstuffs, leucine content, 1.****Forage—****crop(s)—**

- chemical composition, effects of soil treatments, Ill. 481.
- diseases, 334.

spring-flooding effects, 192.**flat-pea, digestibility and composition at growth stages comparison, 91.****grass diseases of North Central States, characteristics, U.S.D.A. 822.****high-altitude in southwestern Colorado, Colo. 500.****land—see Land(s).****legume, potentialities of birdsfoot trefoil, 656.****plant(s)—see also Plant(s).**

- breeding, competition, controlled, adaptation, designs and technique, 803.

- nutritional value, factors affecting, 256.

Forecasts, agricultural, postwar, historical perspectives, 1870-1940, 863.**Foreign Agriculture—****February-March 1946, 263.****April 1946, U.S.D.A. 403.****June-July 1946, U.S.D.A. 724.****August-September 1946, U.S.D.A. 911.****Forest(s)—****Brazilian, yellow fever virus, hosts and vectors, annual cycle, 219.****credit, 1930-45, U.S.D.A. 206.****fires, spread in light forest fuels, 56.****game—see Game.****from grassland in Kentucky "Big Barrens," 182.****management, aerial photographs, specifications, 667.****management, needs of timber requirements of post-war era and future, Miss. 667.****of Ecuador, effects of war and postwar conditions, U.S.D.A. 334.****Forest(s)—Continued****tent caterpillar, diapause recovery and egg hatching, Minn. 225.****tree(s)—****diseases, 835.****in prairie climate, ecological relations, 167.****longleaf-slash pine, grazing, influence of burning, 57.****machine for planting, description, Mich. 109.****pruning by finger-budding method, 668.****seedlings, growth-regulator effects, 55, 56.****seeds, germination, effect of chemical treatments, 667.****water and related topics, U.S.D.A. 333.****Forestry, research progress reports, U.S.D.A. 140, 142, Ala. 143.****Forestry terminology, Spanish-English glossary, U.S.D.A. 667.****Formaldehyde—****control of onion smut, comparison with dust fungicides, Mich. 844.****reaction with l(—)-histidine, 2.****Formaldehyde-protein reaction, methylene bridges and unreactivity of benzoyl-d(—)-alanine, 764.****Formic acid, content of high-temperature heated milk, 145.*****Formica exsectoides*—see Allegheny mound ant.****Foulbrood, American—****control by sulfa drugs, 544.****disease of honey bees, sulfathiazole, medication, 702.****simple field test, 370.****treatment with sulfa—****experimental report, 702.****opposition, 840.****Four-spotted pea beetle, egg production, influence of population number, 361.****Fowl(s)—see also Chick(s); Chicken(s); Poultry; Turkey(s).****artificially infected with *Salmonella*, carriers, 252.****ascarid, resistance, factor of hydrogen-ion concentration, 388.****blood and tissue chemical studies, 378.****bone tumors injected intravenously with Rous sarcoma pathogene, 896.****breeding for egg production and quality, U.S.D.A. 41.****breeding for lymphomatosis resistance, U.S.D.A. 42.****calcium supplements for, sources, comparison, 95.****cholera—see also Pasteurellosis.****domestic, synthetic estrogens, activity on oral administration, 234.****incubation temperature, effects on character expressions, 188.****Fowls, laying, day-length effects, Fla. 96.****lice, control by DDT, 88.****low-producing, ovarian effects of FSH and LH, 189.**

Fowls—Continued

lymphomatosis transmission, 567.

Malayan virus disease, 397.

male—

breeding, selection by sisters' performance, 44.

sexual maturity inheritance, 45.

nematode *Ascaridia galli*, glycogen utilization in vitro and in vivo, 397.

neoplastic disease, history, incidence, and seasonal variation, 396.

plague investigations in war research program, 567.

poisoning by experimental zinc phosphide, 397.

progeny tests, number of daughters necessary, 497.

salmonella types, occurrence and distribution, I, isolation from hen's eggs, 252.

sarcoma, transmissibility, influence of genetic factors, 326.

Single-Comb White Leghorns, iris-color relation to egg production and mortality, 97.

temperature effects on energy and gas metabolism from hatching to maturity, 96.

toxicity of sodium chloride, 566.

typhoid—

diagnosed in guinea fowl, 860.

efficacy of recently developed sulfonamides, 860.

infection, control by sulfa drugs, 568.

vitamin supplements in rations of breeding and laying, 95.

Fox(es)—

carotene utilization, comparison with vitamin A, [N.Y.] Cornell 521.

in Wisconsin, 682.

reproduction, effect of mating time, 520.

France, physiological races of *Puccinia graminis tritici*, 512.*Fraeninus* spp., epidermal characters differentiating, 38.**Freezer(s)—**

home, construction, Minn. 402.

home, development, 578.

Freezing—see also Agricultural products;

Food(s); Fruit(s); Lockers; Meats;

Vegetables; *specific kinds*.

batters and doughs before baking, 124.

level and thunderstorms, 167.

Froghoppers, on sugarcane, insecticidal trials, 84.

Frost—

apple drop after, prevention by growth substances, 51.

injury to hillculture plants, variations, 475.

protection to fruit crops, ineffectiveness of infra-red rays and smoke, 816.

spring, with special reference to frosts of May 1935, 779.

Frozen foods—see Food(s) frozen; *specific kinds of food*; Locker plants.

Fructosan, synthesis, mechanism in frozen beets, 184.

Fruit(s)—

and pressure-cooker gauges, 125.

blanching and cooling for frozen pack, 417.

blanching, by steam and sulfur, 126.

canning cooperatives, status, 1943-44, U.S.D.A. 584.

crop diseases, 335.

crops, frost protection, ineffectiveness of infra-red rays and smoke, 816.

cut dehydrated, production, new methods, I-III, 270.

dehydrators, farm, mechanical features, 110.

dried packaged, fumigants for, 77.

freezing—

at home, U.S.D.A. 418.

preservation, 124.

preservation, varieties for, 124.

fresh—

nutritive-value retention, 121.

shelf life, lengthening, Ohio 877.

freshness, preservation from harvest to consumption, 266.

frozen, in bulk packages for home use, Minn. 589.

granules, preparation and uses, 588.

growth and ripening, seed-pericarp relations, 38.

juices, preservation, German methods, 417.

pests, control in Kansas, Kans. 816.

preservation, by sulfur dioxide solution, 126.

processed, Government inspection, questions and answers, U.S.D.A. 404.

products and byproducts, 265.

small, dehydration, 123.

soft, insect pests, control by DDT, 363.

spillage prevention by epoxides, 126.

stone, bacterial canker, 678.

sulfur dioxide content, determination, 306.

three new varieties introduced by Minnesota Fruit Breeding Station, Minn. 331.

tree(s)—see also *specific kinds*.

airplane dusting practical, 72.

deciduous, little-leaf, treatment, 677.

growing for home use, Ohio 50.

pollination, Wash. 202.

root diseases, review, 72.

stickers for lead arsenate sprays, Conn. [New Haven] 531.

weather injuries, Va. 629.

varieties for South Dakota, S. Dak. 202.

vitamin C content, polarographic assay, 18.

weather injuries, Va. 629.

Fuel-oil emulsions, quick-breaking, containing DDT, 358.

Fuels, alcohol motor, iron pentacarbonyl as antiknock agent in, 165.

Fuels, nonpetroleum, automotive-engine usage, 108.

Fumigation—

- chamber for methyl bromide—
 - construction and operation, Ala. 684.
 - determination by modified ethanolamine hydrolysis method, 152.
- low-temperature, control of European corn borer, 356.
- wheat, effect on viability and relation to baking quality, 813.

Fungus(1)—

- antibiotics, production, 483.
- Chilean, hosts, preliminary list, with biographical references, 315.
- cultures, mites infesting, biology, classification, and control, 698.
- dictionary, 315.
- fleshy of Iowa, illustrations, VI, poroid forms, 315.
- flora of Utah and Nevada, U.S.D.A. 670.
- growth substances in parasitic and saprophytic, 59.
- microscopic mounts, preparation, use of Aerosol OT, 646.
- mold, electronic destruction, 126.
- mold, inheritance N.Dak. 180.
- pathogenic to man, action of sulfonamides, 315.
- plant-pathogenic, physiologic specialization, 60.
- seed-borne, IV, *Acremonia*, *Chlamydomyces*, and *Trichocladium*, 670.
- spores, aerial dissemination, U.S.D.A. 517.
- stale-medium effects on, 32.
- variation induced by bombardment with neutrons, 32.
- wood-destroying, alcoholic fermentation of carbohydrates and dehydrogenation of alcohols, 347.

Fungicidal control of powdery mildew of cantaloups, Calif. 343.**Fungicide(s)—**

- analyses, 1945, Maine 201.
- and their action, book, 61.
- annual consumption and improvement needs, 508.
- copper—
 - cryolite compatibility with, 80.
 - mechanism of action, 62.
- dust, control of onion smut, comparison with formaldehyde, Mich. 344.
- eradication of *Colletotrichum wilt* in lily bulbs, 347.
- for—
 - follage, gloxalidine derivatives, I, II, 509.
 - garden seeds in western Washington, Wash. 215.
 - plant diseases, new and old, Colo. 336.
- new developments, 356.
- organic, new—
 - apple-disease trials, 72.
 - testing, (1945), 62.
- organo-mercurial, effect on potato dry rot incidence, 67.
- phenolic, quantitative determination, 778.

Fungicide(s)—Continued

- polymeric organic polysulphides, 510.
- research basis, physiological and biochemical, 821.
- sold during 1945, analyses, N.J. 816.
- textile, effectiveness 899.
- tunnels, weighing, descriptions, 149.
- Furfural-yielding constituents of wheat straw, as influenced by sodium hydroxide solutions, 6.
- Furnishings, fabric, sewing for home, book, 435.
- Fusarium—**
 - avenaceum*, potato wastage in storage by *F. caeruleum* vs., 67.
 - caeruleum*, potato wastage in storage by *F. avenaceum* vs., 67.
 - disease of prickly pear, 829.
 - javanicum*, antibacterial pigment, 814.
 - liri*, cause of flax wilt, variation and variability, N.Dak. 210.
 - oxysporium cubense*, inhibition by Meredith's actinomycete, 60.
 - wilt of tomato—
 - relation to plant nutrition, 515.
 - resistance, interpretation, 516.
- Fusiform rust, threat to slash pine plantations, Miss. 219.
- GR—S latices, densities, measurement, 767.
- Galactose ethers, preparation, 293.
- Galactose utilization by albino rat, effect of fat, 454.
- Gallnuts, Chinese, general study, 57.
- Galls, bacterial plant, and causal agents, comparisons, 59.
- Galls, powdery, of Lauraceae, 681.
- Gallus domesticus*, twin production, 803.
- Game—**
 - food plants, soil-fertility standards, 520.
 - forest, restoration and management, Pittman-Robertson contributions, 681.
 - in Nova Scotia, report, 1945, 681.
- Ganoderma root rot of citrus, 679.
- Gapeworms of galliform and passeriform birds in New York State, 369.
- Garbage disposal on farm, U.S.D.A. 724.
- Garden crops, diseases in Georgia (1945), U.S.D.A. 58.
- Garden, home, disease losses, reduction, Miss. 675.
- Gas(es)—**
 - combustion of producer, thermodynamics of, 162.
 - digestor, automobile usage, 109.
 - penetration through food packages, rate measurement, 126.
- Gas-holder waters, fouling, prevention, 32.
- Gasolene, digester gas substitute for automobiles, 109.
- Gastroenteritis—
 - outbreak from *Salmonella pullorum*, 252.
 - transmissible, in pigs, 894.
- Geese, Canada, age and sex criteria and weights, 523.
- Gel powders, pectins, dispersibility due to sugars, 413.

- Gelatin, influence on nicotinic acid requirement of chicks, 549.
- Gene theory, new, and explanation of phenomenon of dominance to Mendelian segregation of cytogene, 498.
- Genera, names, abbreviations, 755.
- Genetic characters, in fowls, as influenced by incubation temperatures, 188.
- Geography, plant role in, 181.
- Geology, book, 143.
- Geometridae—
of Iowa, preliminary report, 534.
two new characters seen without dissection, 853.
- Geomysococcus* spp. on rodents, descriptions, 88.
- Georgia Station, report, 1945, Ga. 436.
- Geraniaceae, fourteen species, seed key, 316.
- Germicides—
for dairy industry, 99.
new, for food processors, 268.
- Germination and seedling growth, III, 316.
- Ginkgo biloba*, cortex, pith, and procambium, development, origin and pattern, 493.
- Ginkgo biloba*, shoots, long and short, development, I, 493.
- Glacial anticyclone theory, examination in light of recent meteorological data from Greenland, I, 628.
- Gladiolic acid, antifungal and antibacterial metabolic product of *Penicillium gladioli*, 637.
- Gladiolus, botrytis corm rot, 74.
- Glassware, cold wet, writing on by wax pencils, 471.
- Globin, human or beef, inability to support normal hematopoiesis in rat without isoleucine, 737.
- Gloeosporium* sp., cause of dieback of camellia, Miss. 829.
- Glomerella cingulata* strain, cause of anthracnose of lespedeza, 671.
- Glossina* spp. of French West Africa, monograph, 700.
- Glucoscorbic acid, feeding to white rats, chickens, and guinea pigs, effects, 747.
- Glucose decomposition, oxidative pathway, [N.Y.] Cornell 766.
- Glucose, ethers, preparation, 293.
- d-Glucose-L-sorbose, isolation and structure of enzymically synthesized crystalline, 4.
- Glues, tacky and remoltening, peanut protein hydrates as, 164.
- Gluten dispersion or disintegration, effects of papain, yeast water, cysteine, and glutathione, indications, 609.
- Glycerin, supplement in water-soluble herbicidal sprays, 814.
- Glycogen in tissue slices, rapid microdetermination, 776.
- Glycerides, feeding to rats in nutritional studies on milk fat, 555.
- Glycols, di- and triethylene as manostat fluids, 770.
- Glycosides, acetyl groups in acetates of, microdetermination, 153.
- Glycosides, hydroxyl content, microdetermination, 153.
- Glycine, biological conversion of L-serine to, 450.
- Glyoxalidine derivatives, fungicidal value for foliage, I, II, 509.
- Gnorimoschema operculella*—see Potato tuberworm.
- Goat(s)—
abscesses in, *Corynebacterium ovis* causing (?), 104.
listerellosis case, clinical and laboratory study, 104.
live weight versus metabolic body size, 711.
muscle meat, protein value, comparison with cow and buffalo, 275.
- Gold, organic compounds, synthesis, 296.
- Golden nematode on Long Island, N.Y. State and Cornell 825.
- Gonadotropin(s)—
chick response to, 189.
chorionic, effects on cystic ovaries in cow, 392.
equine, estrus in lactating sows induced by, 46.
ovarial effects on chicks and hens, 189.
- Goniocotes hologaster*—see Fluff louse.
- Gopher, pocket, relation to soil erosion on mountain range, 349.
- Goslings, vitamin D requirements, 710.
- Gossypol—
antioxidant activity, temperature effects, 6.
carotene-protecting antioxidant, 6.
in cottonseed—
and cottonseed meal, assay of extractable, 14.
meal and meats, estimation, 776.
oil, estimation, spectrophotometric method, 776.
- Government institutions, local, financing in nine Vermont towns, Vt. 733.
- Government, local, economic study in fifty Vermont towns, Vt. 868.
- Grade labeling, teaching, 734.
- Graft inoculations with affected fruit tissue, means of transmission of peach wart, 827.
- Grain(s)—
choline content, 273.
feed, production and consumption in war and peace, U.S.D.A. 260.
root rots and leafspots, in northern Great Plains and Western States, U.S.D.A. 821.
small, straw strength, [N.Y.] Cornell 803.
spillage in storage, 512.
storage, III, relation between moisture content, mold growth, and respiration of soybeans, 825.
stored, infestation by tyroglyphid mites, ecological studies, 539.
stored, insects, control by DDT, 539.
- Gramineae hybrids, artificial and natural, II, *Agropyron*, *Elymus*, and *Hordeum*, 798.
- Gramineae, hybrids, artificial and natural, I, *Elymus*, *Sitanion*, and *Agropyron*, 648.

- Granite grit, supplement to chick starting ration, 551.
- Grape(s)—
 chlorosis experiments at Southern Great Plains Field Station, Woodward, Okla. 679.
 court-noué, heteroauxin role in, 73.
 frost injury in microclimatic areas, 475.
 juice, *d*-isoascorbic acid as antioxidant in, 124.
 juice, vitamin B stability, 279.
 leaf skeletonizer, outbreaks and control in California, 695.
 muscadine, freezing, 271.
 performance, effect of climate in Michigan, 1945, 311.
 Pierce's disease, virus causing, ten additional leafhopper vectors, 828.
- Grapefruit—
 Florida, ascorbic acid concentration, seasonal changes, 283.
 heart freezing, best methods, 881.
 juice, ascorbic acid content, effect of commercial canning and short-time storage, 283.
 juice, organic acids, 506.
- Grapevines, fruiting, weather conditions detrimental, 1945, Ohio 779.
- Grass(es)—
 diseases, 334.
 dormant, fungi isolated from, in North Dakota, 335.
 fat and phosphatide content, 453.
 for reseeding abandoned farm lands in Idaho, Ida. 654.
- forage—
 preferences in high altitudes, Colo. 500.
 soil tests in Nebraska, 481.
 spring-flooding effects, 192.
- grubs, control by lead arsenate, 83.
- hay and pasture—
 palatability for sheep, Oreg. 843.
 summary of research (1902-45), Alaska 190.
- new, Mandan wildrye and green stipgrass, N. Dak. 656.
- New Jersey swamp, 180.
- oil from Guatemala, U.S.D.A. 667.
- perennial range and pasture, roots, length of life, 501.
- phialea blind-seed disease, 69.
- prairie species following reseeding, establishment, 326.
- range, *Labops* damaging, 77.
- range, underground materials, annual increase, 317.
- root rots and leaf spots in northern Great Plains and Western States, U.S.D.A. 821.
- seed, harvesting, cleaning, and processing, techniques developed by U.S.D.A., Okla. 723.
- small-seeded, Iowa air-blast seed separator trials, Iowa 200.
- Xanthomonas translucens* parasitism, 62.
- Grasshopper(s)—
 and locusts in Western Australia, 686.
 and other Orthoptera of Arizona, index supplement, Ariz. 686.
 baits, benzene hexachloride, 686.
 feeding, differential, relation to local distribution, 353.
 oviposition in coal pile, 221.
- Grassland—
 change to forest in Kentucky "Big Barrens," 182.
 improvement for northeastern U.S.A., U.S.D.A. 192.
 range, succession in conservatively grazed, 191.
 succession, quantitative study, 182.
- Gravel cultures, large-scale, for plant research, 783.
- Gray mold studies, 346.
- Grazing—
 Alaska tundra, 349.
 controlled, eradication of bindweed, Minn. 505.
 in longleaf-slash pine type, burning effects, 57.
 milk cows, effect of warm weather, 380.
- Great Basin, stream flow measurements, 1944, 399.
- Great Britain—
 avian salmonellosis, survey, 721.
 plant pathologists, recruitment and training, 669.
- Green—
 dwarf of potato, virus disease, 824.
 peach aphid, vector of—
 beet mosaic and beet yellows, 70.
 tobacco rosette, 71.
 stink bug, control by sabadilla, 77.
- Greenbug of cereals in Uruguay, 688.
- Greenhouse, soils, chemical disinfection, 61.
- Greenland ice sheet, weather, control, 628.
- Grey lung virus, pathogenic for mice and other rodents, 683.
- Grouse, blue, blood parasites, 683.
- Growth regulators—see Plant growth regulators.
- Guar, germination, 808.
- Guatemala—
 grass oil, U.S.D.A. 667.
Kalotermea nigritus n. sp., description, 888.
- Guavas, vitamin C content, 283.
- Guayule—
 betaine isolation from, 3.
 cultivated, diseases and control, U.S.D.A. 679.
 diplodia die-back, 680.
 growth and rubber content, effects of variations in soil moisture stresses, 807.
 growth in soil, relation of toxic substances to, 823.
 morphology of reproduction, 324.
 plants, toxic substances, relation to growth of guayule in soil, 323.
 rubber in tissues, stain technique, 21.

Guayule—Continued

selections from natural population, evaluation, 196.

thickly seeded, rubber production, 808.

tissue, resin content, determination, rapid photometric method, 777.

tissue, rubber content, determination, rapid photometric method, U.S.D.A. 777.

transplanting, topping benefits in, 47.

Guinea fowls, infection with fowl typhoid, 860.

Guinea pig(s)—

dietary factors essential—

VII, changes in distribution of plasma protein during deficiency, 592.

nature, 138.

immunization against *Brucella* infection, 244.

nutrition, vitamin A and carotene, 597.

Gulf Coast ticks, control by DDT in Florida, 542.

Gulley, Frank Arthur, and George Washington Curtis, two early agricultural teachers in Texas, 587.

Gum spirits, destructively distilled wood turpentine in, detection by aniline point, 21.

Gutta hydrocarbons in plant materials, differentiation, 777.

Gypsum—

effect on plants grown on acid soils, comparison with lime, 787.

soil corrective and builder, Ariz. 28.

Gypsy moth, control, 352.

Habronemiasis, equine, xenodiagnosis, 105.

Haemagogus mosquitoes in Colombia, 288.

Haemagogus spp., South American, life history and biology, 87.

Haemaphysalis leporis-palustris—see Rabbit tick.

Haematopinus suis, eradication by single treatment of DDT, 543.

Haemolaelaps scalopti n. sp. from mole, description, 369.

Hall, variation in—

atmospheric concentration, 167.

physical properties, 167.

Hairy chinch bug, control by sabadilla and DDT, 833.

Hams, overseas, preparation, retention of thiamine, riboflavin, and nicotinic acid, 279.

Hamster, golden, ovariectomized, estrus induction, 189.

Hamster, rickets, experimental, 748.

Haptoncus californicus n. sp. description, 865.

Hardening, frost, in winter cereals, with gas change, 486.

Hardwoods, decay following glaze storm damage in New York, 829.

Hardwoods, southern, growth, wood, and uses, book, 507.

Harvester(s)—see also specific kinds.

Hawaii—

Apanteles trifasciatus n. sp. from cotton bolls, 831.

Hawaii—Continued

blossom mildew, identity and host plants, 831.

foods used by Filipinos, Hawaii 734.

new urothripid, description, 831.

thrips, additions and new species, 830.

vegetables, Hawaii 734.

vegetables, iron availability, 595.

virus diseases of plants and their insect vectors, 820.

Hawaii National Park, plants illustrative of plants and customs of South Seas, treatise, 315.

Hay—

barn-curing equipment, design, relation to resistance of hay to air flow, 576.

barn-drying, complications, Wis. 401.

barn-drying, success, Mass. 401.

carotene, preservation by autoclaving and waxing Wis. 297.

chemical composition, effects of soil treatments, Ill. 481.

crop, harvesting, U.S.D.A. 870.

cured partially, handling equipment, 575.

curing—

in stack with forced air, 577.

systems, barn, rate of moisture removal, factors controlling, 255.

system, mow, requirements, calculation, 256.

driers—

barn, slatted floor, handbook of design, 862.

forced ventilation, 255.

operation in Virginia, 573.

Hay—

drying experience, seven years, 574.

grasses and legumes for, summary of research (1902-45), Alaska 190.

harvesting for labor saving. Vt. 728.

Kobe lespedeza, digestibility, 231.

long, air distribution, 575.

loss of nutrients during storage, 370.

moisture absorption when exposed to atmospheres of various moisture content, Mich. 723.

prairie, feed value cut at different stages, progress report, 373.

preservatives, prohibitive quantities necessary for moist hay, N.Y. State and Cornell 328.

resistance to air flow and relation to design of barn hay-curing equipment, 576.

sweetclover, chemical composition and digestibility, effect of maturity, U.S.D.A. 545.

Haymaking machinery and methods, new, in western Nevada, Nev. 573.

Haymaking methods, Minn. 584.

Health, rural—

conditions, survey, U.S.D.A. 120.

facilities—

comparison with urban, Ohio 732.

in Missouri, Mo. 409.

Health, rural—Continued

postwar problems and programs in Nebraska, committee reports listed, Nebr. 111.

Heat transfer coefficients, calculation, nomograph, 802.

Hedera helix, mitosis-respiration correlation in, 37.

Hedges, farm, use of multiflora rose, 817.

Helminths—

bovine, incidence in Northern Nigeria, 245.

parasites of birds and mammals in western Massachusetts, 830.

parasites of skunks in Texas, 221.

Helminthiasis, gastrointestinal, control in sheep by ten per cent cunic, 564.

Helminthosporium—

cause of blight of oats, 511.

sp., cause of new seed-borne disease of oats, 824.

turcicum leaf blight of corn, 824.

Hematopoiesis in rat, normal, necessity for isoleucine added to human or beef globin, 737.

Hemicelluloses—

chemical investigations, Mass. 308.

quantitative estimation, 301.

Hemiptera in potato fields of Sweden, 211.

Hemoglobin formation following amino acids to rats fed low protein diet, 593.

Hemoglobin regeneration by anemic rats, effects of iron compounds, 506.

Hemp, American, yields and breaking strengths, effects of fertilizers, 808.

Hemp, retting, I-III, 808.

Hens—*see also* Chickens; Fowl(s); Poultry. breeding, ration, significance of riboflavin level, 548.

choline requirements, 707.

diet, effect on efficiency of egg production, 547.

fed soybean oil meal—

effect on viability of progeny, 547.

supplements, effectiveness in increasing hatchability of eggs, 547.

feeding and management in laying cages, N. Mex. 706.

feeding thiouracil, effect on thyroid gland of chicks, 234.

old, meat quality, effect of estrogens, 709.

ovulation frequency, relation to follicular atresia after surgery, 190.

ovulation, interruption by nonspecific substances, 189.

reproductive tract, effects of hypothermia, 653.

twin production, 803.

Henry R. Carter Memorial Laboratory of U.S. Public Health Service, investigations, 540.

Herbal of Rufinus, printing of thirteenth century manuscript, 30.

Herbicide(s)—

carbon disulfide use, Calif. 48.

control of weeds in canning peas, Mich. 49.

Herbicide(s)—Continued

toxicity and persistence in greenhouse plots relation to soil reaction, U.S.D.A. 478.

water-soluble, glycerin as supplement, 814.

Herbs, savory, culture and use, U.S.D.A. 505.

Hessian fly—

in spring wheat of southwestern North Dakota, N. Dak. 360.

infestations in Tennessee and Kentucky, 77.

resistance derived from W38 and durum P.I. 94587, inheritance, 500.

resistance in wheats, relation to temperature, 224.

Heterauxine—

effect on cells of diseased plants, 207.

role in court-noué of grape, 73.

Heterodera—

major, cereals root eelworm in North Wales, 670.

marioni, root-knot nematode, host-parasite relationships, II, effects of host on parasite, 348.

rostochiensis, life history on Long Island N. Y., 69.

schachtii, soil populations as influenced by cropping, 70.

Heteronychus sanctae-helenae, control by application of DDT to soil, 531.

Heterozygosity—

effect in variability and vigor, 650.

in animals, reduction by inbreeding, 187.

maintenance in homothallic fungus species of *Neurospora tetrasperma* type, 651.

Hexachlorethane-bentonite suspension for removal of common liver fluke from sheep, 856.

Hexachlorocyclohexane, gamma isomer, control of *Boophilus australis* in Argentina, 700.

γ -Hexachlorocyclohexane, antilinositol effect, 706.

Hexyl resorcinol, penetration into *Ascaris lumbricoides* var. *suis*, effect of surface substances, 242.

Hibiscus—

cannabinus, fiber yield, influence of planting time and spacing, 197.

cannabinus, seed yield, influence of planting time and spacing, 197.

cuttings, origin of roots, 35.

Hide beetles, control by DDT, 837.

Hiliculture plants, frost injury, variations, 475.

Histidine, determination in protein hydrolysates with *Leuconostoc mesenteroides*, 618.

Histidine, utilization by man, 736.

l(-)-Histidine, formaldehyde reaction, 2.

Hog(s)—*see also* Pigs; Sows; Swine.

bacon, ration, effects of vitamin B and protein in supplements to barley and wheat, 376.

Hog(s)—Continued

- cholera, virus concentration in blood of artificially infected swine at different stages, 894.
- fattening on cull peas in dry lot, Idaho 705.
- fattening, cull peas protein supplement, 377.
- feeding for pork and lard production, U.S.D.A. 725.
- market, utilization of oats, effect of fineness of grinding, 377.

Home—

- demonstration agent, U.S.D.A. 410.
- economics—
 - leaders, development of, 120.
 - omnibus, textbook, 410.
 - research progress reports, U.S.D.A. 141.
- equipment—
 - postwar, 285.
 - shopping for, symposium, 285.

Homemaking activities, time expenditures in 188 Vermont farm homes, Vt. 751.**Honey—**

- pH values of samples compared, 89.
- invertive activity, relation to degree of pigmentation, 620.
- protection against metallic corrosion, 702.
- bees—*see also* Bees.
 - American foulbrood disease, sulfathiazole medication, 702.
 - central nervous system, lipid content, 280.
 - pollinators in production of hybrid cucumber seed, 370.
 - strong colonies and forces, re-emphasis, 840.
 - toxic action of dinitro compounds, 702.

Hookworm, pathogenicity in lambs fed adequately, 568.**Hopvine borer and control in New York hop yards, N.Y. State and Cornell 361.*****Hordeum* hybrids, artificial and natural, 798.****Hormonal syndromes induced by unrelated chemicals, accompanying parthenocarp, 689.****Hormones—**

- adrenocorticotropic, effect of various reagents on, 611.
- biological action, manual, 188.
- estrogenic—*see also* Estrogens.
- growth—*see* Plant growth hormones.
- sex—
 - biological action, manual, 188.
 - from animals, effects on dioecious plants, 485.
 - in veterinary practice, 241.
- tomato, greenhouse tests, Minn. 202.

Horn fly—

- control by DDT in Florida, 542.
- control by DDT in Kansas, 542.

Horse(s)—

- anesthetic, newly developed, 386.
- diseases, research progress reports, U.S.D.A. 99.
- farm power, factors affecting, Mich. 378.

Horse(s)—Continued

- foal, *Corynebacterium equi* infection, 100.
- habronemiasis, xenodiagnosis, 105.
- larynx, changes associated with laryngeal hemiplegia, 566.
- Morgan, U.S. farm, work and objectives, 44.
- Okinawa, sera, complement-fixing and neutralizing antibodies against Japanese B virus, 247.
- Palomino, genetics, 652.
- parasitic aneur, incidence, 395.
- penicillin dosage and blood levels, 566.
- salmonellosis outbreak, 247.
- strangles, chemotherapy, 100.
- "1080" poisoning, clinical observations, 720.
- tetanus, fatal, penicillin therapy, 395.

Horticulture, research—

- by experiment stations, progress reports (1945), U.S.D.A. 142.
- progress reports, U.S.D.A. 140, 142, Ala. 143.

Hosery, size and fitting standards, new device being perfected, 435.**Host-parasite check list revision, *Pisum*, 335.*****Hosta*, variegated, chondriosomal systems, involvement in seasonal changes in biological equilibria, 519.****Houma Station, sugarcane disease testing and initial seedling selection, 1945, U.S.D.A. 674.****House(s)—*see also* Buildings; Poultry Houses; Shelters.**

- ants, revision, U.S.D.A. 888.
- farm—*see* Farmhouses.

fly(ies)—

- brain and muscles, histological effects of sesamin, 540.
- control by pyrethrum and DDT aerosols, laboratory tests, 541.
- larval control by benzene hexachloride, 77.
- toxicity of DDT compounds and pyrethrum, comparisons, 229.
- future, planning, remodeling, and equipping, 436.
- new, building, book, 724.

Household—

- insects, control by DDT, 539.
- refrigeration, servicing, 724.

Housing—

- postwar, Nebr. 111.
- research progress reports, U.S.D.A. 140.

Human—

- beings, adult, protein requirements in individual foods and food combinations, 592.
- beings, utilization of *d*-amino acids, III-IV, arginine and acetyltryptophane, 593.
- body, adult, chemical composition and bearing on biochemistry of growth, 292.
- body, choline excretion, effect of choline intake and environmental temperature, 422.

Human—Continued

bioassay technique for determination of physiological availability of vitamins, 425.

respiratory quotient, response after glucose administration, effects of dietary carbohydrate, 594.

Human Nutrition and Home Economics, Bureau of, report of Chief (1945), U.S.D.A. 140, 141.

Humidity, atmospheric, relative, measurement, 309.

Humidity, effects on cellulosic materials, including tire cords, 284.

Hurricanes—

North Atlantic, and tropical disturbances of 1945, 629.

rainfall distribution analyzed, 23.

ring of violent upward convection, 23.

Hy-Kresol, tail mites on mink controlled by, 88.

Hybridization, interspecific—

in *Parthenium*, 39.

tetraploid carnations, 40.

Hybrids—

species, cellular antigens, individual differences, 190.

trigeneric, *Elymus* × wheat × rye, 649.

Hydrangea paniculata grandiflora, rutin isolated from flowers, 9.

Hydrobacteriology, marine, book, 30.

Hydrocarbon(s)—

administration methods for sheep, 104.

chlorinated, insecticidal tests, 79.

Hydrocarbon-alcohol mixtures, water solubility in, 166.

Hydroecia immmanis—see Hopvine borer.

Hydrogen—

ion(s)—

and plant nutrition, 183.

concentration, effect on fungistatic activity of dinitro-*o*-cresol, 207.

determination, apparatus, 149.

peroxide, action on carbohydrates, 294.

peroxide, nitrate impurities in 30 percent, removal technique, 10.

Hydrology, soil relations, apparatus for recording, 108.

Hydrolysis, determination of tryptophane, phenylalanine and methionine, rapid procedure, 301.

Hydroxyl, in organic materials, determination by macro- and semimicromethods, 154.

Hydroxyls, microdetermination in glycosides and sugars, 153.

Hygrometer, electric, simple theory, 474.

Hypochlorite, effect on milk bacteria and chemistry, 8.

Ice cream—

fruit purees, 858.

manufacture, invert sirup preparation, new methods, 765.

mix, dry, development, progress, 853.

Ice cream—Continued

mix, keeping quality, relation to separation temperature and heat treatment of skim milk, 558.

sugar conservation, 99.

technical literature for 1945, 558.

vitamin source, 131.

Ices, sugar conservation in, 99.

Ichthiometer for charting migration times of perch, description, 525.

Idaho Station, notes, 607.

Idaho University, notes, 607.

Idiodonus, Mexican species, 221.

Illinois Station, notes, 607.

Illinois University, notes, 607.

Incinerator beetle in Connecticut, 352.

Income—see Farm(s) income.

Incubation temperatures of eggs, effect on character expressions in fowls, 188.

"Indalone," photochemical dimerization, 4.

Index numbers of production, prices, and income, Ohio 872.

India, malaria control by pyrethrum spraying, 698.

Indiana Station, notes, 288.

Indigobush, insecticidal properties, U.S.D.A. 832.

3-Indoleacetic acid, in corn kernels, isolation from immature, 35.

Indophenol-xylene extraction method for ascorbic acid and modifications for interfering substances, 626.

Industrial development, agricultural relations, Nebr. 111.

Industry, heavy, pollution of atmosphere meteorological control, 780.

Infants, nutrition relations to diets of mothers, 127.

Influenza, swine, purified virus, formalin-inactivated, vaccination with, antibody response of swine, 718.

Infra-red rays, ineffectiveness for frost protection to fruit crops, 816.

Inheritance of production by animals, evaluation method, 798.

Insect(s)—see also specific kind and names.

affecting cranberries, report, 836.

and insecticides, notes, 533, 684.

beneficial, protection from DDT, N.C. 702.

bioclimatics, 169.

chitinous cuticle, correlation with sensitivity to DDT, 529.

collection and preservation, U.S.D.A. 830.

community on perennial peppergrass in southern New Mexico and southwestern Texas, 830.

control, research progress reports, U.S.D.A. 142.

control with DDT, 366.

correlations of flight and vision, 78.

correlations of wings and ocelli, 78.

distance dispersion rates, 208.

effects—

of fabrics impregnated with DDT, 85.

variations in atmospheric pressure, 685.

Insect(s)—Continued

- egg, waterproofing mechanism, 352.
 - fauna of Swedish potato fields, and role as vectors of virus diseases, 211.
 - flying, control by insecticidal mists, I, spray testing chamber, design, 356.
 - flying, effect of insecticidal mists, factors influencing, II, 528.
 - influence of soil minerals, 532.
 - metamorphosis, concealed phases, 685.
 - nutrition, folic acid, importance, 685.
 - of Connecticut, guide, VI, mosquitoes, 366.
 - pests—
 - DDT control, research progress in co-operative project, 79.
 - of animals and man, DDT tests summarized, 85.
 - of cotton, status and control in Lower River districts of Nyasaland, 535.
 - of Cuba, catalog, 532.
 - pollinators of alfalfa in California, 535.
 - population problems, incomplete block experimental designs for, 77.
 - relations to weather, discussion at joint meeting, in London June 20, 1945, 780.
 - repellent(s)—
 - Indalone as influenced by sunlight, 4.
 - new German synthetic, 80.
 - No. 612, trials with, 80.
 - properties of 2-ethylhexanediol-1,3, 79.
 - responses to colors, 351.
 - vectors of virus diseases of plants, Hawaii 820.
 - vegetable garden, handbook, U.S.D.A. 505.
 - Insecticidal—
 - mists, control of flying insects, I, spray testing chamber, design, 356.
 - mists, effect on flying insects, factors influencing, II, 528.
 - resin of yam bean, constituents, 9.
 - sprays, investigations, 357.
 - Insecticide(s)—
 - analyses, 1945, Maine 201.
 - and insects, notes, 684.
 - application relations to leaf areas, 78.
 - chlorinated-hydrocarbon tested as, 79.
 - concentrated, dispensing, sprayers, 831.
 - contact, mode of entry, 78.
 - DDT content, determination, 778.
 - DDT, more research needed, N.Y. State and Cornell 588.
 - Euphorbia* spp., extracts as, 80.
 - German, evaluation, 222.
 - materials of vegetable origin, quarterly bibliography, No. 82 (July-December 1945), 222.
 - new—
 - German synthetic, 80.
 - slx, use, 832.
 - use in dairy plants, 840.
 - organic thiocyanates in, assay, 14.
 - penetration through insect cuticle, 222.
 - research, 1943-45, notes, 533.
 - sold during 1945, analyses, N.J. 816.
 - synergistic action of N, N-diethylpiperonylamide with marc against Mexican bean beetle, 81.
- Insemination, artificial—
 - cows, techniques, 42.
 - dairy cattle—
 - developments, 800.
 - directions, Mo. 98.
 - influence of age on breeding efficiency, 496.
 - intracervical and intrauterine, comparison, 800.
 - Merino sheep, book, 187.
 - practicality in dairy-cattle breeding, 42.
 - studies in Colorado, Colo. 444.
 - institutional equipment, sanitization, 126.
 - Insulin, protamine zinc, antibacterial activity, 313.
 - Insulin-induced rumplessness of chickens, II, III, 802.
 - Insurance—see *specific kind*.
 - Inter-American Conference of Agriculture, third, at Caracas, Venezuela, 1945, 443.
 - International Commission on Zoological Nomenclature, recent opinions, 348.
 - International Institute of Agriculture, activity during the war, 1940-45, 606.
 - Invert sugar, assay by copper reduction method, 15.
 - Invertebrates, abundance variations in Illinois woodland, 350.
 - Iodine excretion by normal human subjects, effect of temperature and potassium iodide, 741.
 - Ions, inorganic, absorption, transport, and exudation by wheat seedling roots, 489.
 - Ions, root-absorption, tracer elements showing, 36.
 - Iowa College, notes, 607.
 - Iowa Station—
 - notes, 607.
 - report, 1945, Iowa 903.
 - Ipomoea lacunosa*, Duvel buried seed experiment, U.S.D.A. 201.
 - Iran, alkali soils, 784.
 - Iris (eye), color in Single-Comb White Leghorns, relation to egg production and mortality, 97.
 - Iron—
 - absorption and utilization of ferrous vs. ferric in anemia, radioactive-isotope determination, 130.
 - availability in Hawaiian-grown vegetables, 595.
 - colorimetric determination, catechol derivative in, 152.
 - compounds, effect on iron retention and hemoglobin regeneration by anemic rats, 596.
 - content in enriched bread, assay, rapid method, 19.
 - effect on production of pigment by yeast, *Torulopsis pulcherrima*, 489.
 - ferrous and ferric, and high-lime chlorosis, relations between, 788.
 - inactivation by 2,2'-bipyridine, and effect on riboflavin synthesis by *Clostridium*, 31.
 - pentacarbonyl, as antiknock agent in alcohol motor fuels, 165.

- Iron—Continued
retention by anemic rats, effect of iron compounds, 596.
- Ironing—
fatigue, relation to posture, 285.
surface height, effect on worker, [N.Y.] Cornell 751.
- Irradiation, biological action, 606.
- Irrigation—
companies in Utah, activities and needs, Utah 583.
developments in Arizona, Ariz. 111.
ditches, small, linings, 400.
furrows, small, soil erosion, Utah 570.
headgate frame, practical, inexpensive, and easy to make, Colo. 253.
under sub-humid conditions, benefits, 724.
- Ichnolaelaps* and *Atricholaelaps*, notes, 701.
- d*-Isoascorbic acid, antioxidant, 124.
- d*-Isoascorbic acid, fatty acid monoesters in fats and oils, assay, 19.
- Isocitric acid, synthesis, 766.
- Isoelectric point of viruses, determination by stain technique, 59.
- Isoleucine, effect on tobacco seedlings, 213.
- Isoleucine, necessity for supporting normal hematopoiesis in addition to globin, 737.
- Isopropyl formate, fumigants for dried packaged fruit, 77.
- Isotope, radioactive, iron absorption in anemia determined by, 130.
- Itaconic acid—
fermentation process, 163.
in fermentation liquors, determination, 302.
- Itaphila*, new species, Nearctic, with keys, 534.
- Ixodes ricinus*—
control by DDT, 701.
ecology, 280.
water balance, 229.
- Jack fruit (*Artocarpus integra*), planting in Coconut Grove, Fla., 667.
- Jamaica—
banana leaf speckle, 519.
coconut palm disease, 519.
Phonomomyia hirsuta n. sp., 228.
- Japanese beetle—
abundance and injury on sweet corn, N.Y. State 361.
attractants, with special reference to caproic acid and phenyl ethyl butyrate, 687.
bait, geraniol-eugenol content modified, 81.
destruction by wheel bug, 355.
ethylene dibromide as fumigant for, 77.
larvae, milky disease, 354.
parasites, competition, 221.
populations, milky disease, development rate, 687.
studies, 352.
- Jar rings, sealing qualities, testing, 882.
- Jelly making in home, use of polyphosphates, 883.
- John's disease—
serological diagnosis in sheep, 893.
vaccination trials against, 103.
- Joint U.S.D.A.-Land-Grant College Policy Committee, notes, 760.
- Juncaceae, *Sclerotinia* spp. on, taxonomic study, 33.
- Jute, photoperiodism in Bengal, 493.
- Kaloterpes nigrinus* n. sp., from Guatemala, description, 838.
- Kale—
ascorbic acid content, effect of storage, Del. 895.
carotene content, availability, 598.
dehydration, 270.
frozen in field, vitamin content, 413.
nutritive value, influence of supplementary calcium and magnesium fertilizers, 413.
- Kansas College notes, 144, 445.
- Kansas Station—
notes, 144, 445.
publications available, Kans. 444.
- Karrua paradoxa* n. gen. and sp. from S. Africa, 80.
- Karyotype evolution, cytogenetic study of *Crepis* spp. and interspecific hybrids, 649.
- Keiferia penicula* n. sp., on eggplant, 225.
- Kenaf, fiber yield, influence of planting time and spacing, 197.
- Kenaf, seed yield, influence of planting time and spacing, 197.
- Kentucky Station, report, 1945, Ky. 905.
- Ketonemia, in ewe and heifer fetuses, 100.
- Ketosis—
comparison with milk fever, 854.
in dairy cattle—
experimental, 560.
practical discussion, 560.
studies VII and VIII, 239.
in Hawaiian Islands, 239.
- Kidneys, chick, excessive ingestion of salt, effects, 105.
- Kiln, charcoal, made of cinder-concrete blocks, Conn. [New Haven] 572.
- Kitchen, planning, Iowa 285.
- Kitchens, farm, fifty, 285.
- Kok-saghyz seeds, germination, effect of alkali, comparison with common dandelion, 643.
- Kok-saghyz yellows, identification with aster yellows, and relation to big bud in tomato, 210.
- Labops*, damage to range grasses, 77.
- Labor—
changes on cotton farms in Arkansas, 1939-44, Ark. 866.
emergency needs during war, farmer co-operation, Mich. 732.
- farm—
efficiency, improvement, Mich. 263.
report (1944), Mich. 111.
research progress reports, U.S.D.A. 140.
requirements for California crops, major seasonal operations, 1945, Calif. 406.
saving through farm job analysis, II, hay harvesting, Vt. 728.
- Laborers, farm, war relocation, Ohio 732.
- Laboulbenia formicarum*, ant hosts, 221.
- Lactation, dairy cows, references to literature of 1940-43, 552.

- Lactic acid bacteria, formation of carbon dioxide, and cultural method of detection, 553.
- Lactic acid, methyl lactate prepared by alcoholysis of polymers, 146.
- Lactobacilli, cultivation, readily prepared medium, 553.
- Lactobacillus*—
arabinosus—
 17-5, pantothenic acid, microassay by, 160.
 biotin assay, growth stimulants, 429.
 strains, utilization and synthesis of tryptophane, 593.
 use in microbiological assays by means of charcoal-treated peptone, 616.
- bulgaricus* incubated at various temperatures, influence of yeast extract, 553.
- casei*—
 factor, incubation, with chick liver, formation of folic acid, 616.
 factor, relation to vitamin M, 748.
 flavin adenine dinucleotide utilization by, as influenced by riboflavin analogs, 179.
 riboflavin utilization by, as influenced by riboflavin analogs, 179.
- helveticus*, effect of unsaturated fatty acids, 295, 553.
- β -Lactoglobulin—
 electrophoretic at neutrality of heat denaturation, 292.
 empirical formula, 2.
 systems, $\kappa\phi$ values, from electroviscosity data, 467.
- Lactose in binary mixtures, estimation, 304.
- Laelaps aplodontiae*, n. sp., new mite from *Aplotonia*, description, 369.
- Lambs—
 enterotoxemia, control by alum-precipitated toxoid, 855.
 enzootic staphylococcal infection—
 associated with tick bite, I, 246.
 associated with tick bite, II, bacteriology, 563.
 fattening in Montana, Mont. 375.
- feeding—
 dehydrated potatoes and alfalfa silage, Colo. 375.
 experiments, [N.Y.] Cornell 843.
 sulfur, results, Colo. 856.
- hookworm pathogenicity with adequate diet, 563.
- infectious enterotoxemias in Colombia, 104.
- production and feeding in El Paso Valley, 547.
- range—
 heritability of face covering and neck folds, evaluation, 325.
 heritability of type and condition, evaluation, 42.
 weanling traits, effects of environmental factors, 801.
- scouring due to tapeworm infestation, control by lead arsenate, 856.
- Lambs—Continued
 stiff, treatment with vitamin E, 855.
- Lamophilocus minutus*—see Flat grain beetle.
- Land—
 agricultural, ownership and operation in southern San Joaquin Valley, U.S.D.A. 260.
 American, abuse and conservation, U.S.D.A. 311.
 classification, economic—
 Botetourt County, Virginia, Va. 260.
 Culpepper County, Virginia, Va. 260.
 Fluvanna County, Virginia, Va. 260.
 Greene County, Virginia, Va. 260.
 Shenandoah County, Virginia, Va. 260.
 Virginia counties, Va. 260, Va. 582, Va. 728.
- farm—
 abandoned, reseeding, grasses and cultural methods in Idaho, Idaho 654.
 classification for tax purposes, technique, Md. 868.
 development and economics in northeastern Minnesota, Minn. 114.
 of high and low productivity, price tendencies, Ohio 727.
- forage, utilization in northeast region, longtime adjustments, 728.
- ownership trends in North Dakota, 1929-44, N.Dak. 867.
- physical conditions in South Carolina, Anderson County, U.S.D.A. 784.
- range—see Range land.
- tenure in Arkansas, IV, labor changes on cotton farms, 1939-44, Ark. 866.
- use—
 and financing of local government institutions in nine Vermont towns, Vt. 733.
 effect on hydrology of soil, apparatus for recording, 108.
 effects of soil properties in West Virginia, W.Va. 476.
 in America, history, book, 26.
- Lantana* poisoning in cattle, 855.
- Lard—
 production, relation to feed consumption, U.S.D.A. 725.
 stability, effect of deodorization and antioxidants, 456.
 stability, improvement by addition of vegetable oils, 457.
- Lateropeltis bambusarum* n. gen. and sp., asocarpic stage of fungus, 679.
- Lathyrus sylvestris wagneri* forage, digestibility and composition at growth stages compared, 91.
- Latin America, directory of agricultural periodicals, societies, experiment stations, and schools, 911.
- Lauraceae, powdery galls, 681.
- Lawn(s)—
 European chafer, control, N.Y. State and Cornell 360.
 home, building and care, Iowa 507.
 planting and care, N.J. 507.

Lawn(s)—Continued

weeds—

control by new acid as supplement for fertilizer, [N.Y.] Cornell 814.

destruction by 2,4-D, N.J. 504, 818.

Laying cages, feeding and management, N.Mex. 706.

Laying house, utilization, Mich. 705.

Lead arsenate—

control of codling moth, ingredients and dosage, Va. 694.

control of scouring caused by tapeworm lambs, 856.

removal of sheep tapeworm, *Moniezia expansa*, preliminary report, 564.

spray stickers for fruit trees, Conn. [New Haven] 531.

treatment for sheep tapeworm, Miss. 717.

Lead—

arsenate-phenothiazine and DDT sprays, Pa. 581.

Lead poisoning of cattle, 245.

Leaf(ves)—

analysis, plant-physiological method of determining fertilizer needs of soil, bases, 321.

geotropic reaction and content of growth hormone in plants, 319.

growth, physiology studies, II, 318.

heat-resistance on cotton grown on saline soils, 36.

metabolism in starving oats, 184.

roll, natural spread, resistance of potato seedling varieties, 825.

root formation in cuttings in relation to, 35.

spots of grains and grasses in northern Great Plains and Western States, U.S.D.A. 821.

tissue, analysis by micromethods, 301.

Leafhopper(s)—

alfalfa resistance, correlation with carotene content, 193.

control by DDT dust, on snap beans, Mich. 860.

new species, descriptions, 221.

nonspecific transmission of California aster yellows virus, Calif. 363.

six-spotted, control by DDT, 357.

transmission of papaya bunchy top, P.R.U. 217.

vectors of California aster yellows virus, Calif. 363.

vectors of virus causing Pierce's disease of grapes, 828.

Leather, mold growth, 900.

Legume(s)—

diseases new to Oklahoma, U.S.D.A. 57.

effects on corn yield, La. 194.

forage, spring-flooding effects, 192.

hay and pasture, research summary (1902-45), Alaska 190.

nitrogen conservation, influence of—management, 27.

time and plowing under, 191.

Legume(s)—Continued

nodule(s)—

formation, factors influencing, 84.

formation influence nitrogenous compounds, 84.

nitrogen-fixing capacity as shown by pigments, 84.

pigments, 84.

seed production, honeybee role, Mich. 88.

seeds, dried, riboflavin, niacin, and thiamine content, 428.

spouts, dietary substitute for fresh vegetables, 266.

virus diseases, 210.

Leguminosae, mosaic, 210.

Lemon(s)—

botrytis mold in Ventura County, 347.

botrytis rot, effect, 347.

organic acids, 54.

storage changes, influence of air circulation and ventilation, U.S.D.A. 54.

Lemongrass oil, production in Guatemala, U.S.D.A. 667.

Lentin in veterinary medicine, 388.

Lepidoptera types, photography, 221.

Lepomis machrochirus—see Bluegill.

Leptosira, association with contagious disease of cattle, 561.

Leptopyga minor—see Ash lace bug.

Lespedeza—

anthracnose, cause and symptoms, 671.

culture and utilization, U.S.D.A. 197.

cuneata, crossing (natural) and segregation in, 198.

intermedia, Duvel buried seed experiment, U.S.D.A. 201.

new species and one new variety, noteworthy Asiatic, 484.

Lesser grain borer, oviposition, influences, 226.

Leatiphorus, North American species, taxonomic study, 355.

Lettuce—

big-vein disease, U.S.D.A. 215.

response to fertilizers, Ariz. 665.

tipburn, effects of maturity, temperatures, and soil moisture tension, [N.Y.] Cornell 215.

Leucine, content in proteins and foodstuffs, 1.

Leucomostoc mesenteroides—

amino acid requirements, 14.

assay of *p*-aminobenzoic acid, 622.

protein hydrolysates with, histidine determination, 618.

Leutenizing hormone, ovarian effects on chicks and hens, 189.

Levulose, assay by copper reduction method, 15.

Libellulidae, distribution and seasonal abundance in Indiana, 80.

Lice—see also Cattle lice.

body, control by methyl bromide, 865.

Light—

artificial, effect on egg production of late-hatched pullets, N.Dak. 379.

- Light**—Continued
in pine production, 333.
intensity, influence on ovulation in turkeys, 710.
- Lighting**—
farmstead, planning, 257.
poultry for egg production, Wash. 705.
- Lignin**, agricultural waste investigations, 308.
- Ligustrum lucidum***, mitosis-respiration correlation in, 37.
- Lygus burmeisteri***, pest of cultivated plants in Argentina, 687.
- Lily**—
bulbs—
Colletotrichum lilii in, eradication, 347.
forcing after treatment for nematode control, 218.
plantain, seasonal changes in biological equilibria, 519.
weevil, potentially serious pest in Pacific Northwest, U.S.D.A. 364.
- Lime**—
agricultural, products, inspection, season 1945, Mass. 790.
chlorosis due to, in Idaho plants, Idaho 58.
effect on plants grown on acid soils, comparison with gypsum, 787.
requirements of cotton rotated with peanuts, 807.
resources, production, marketing, and use in U.S., U.S.D.A. 632.
- Limestone**—
phosphorus determination, photometric method, 151.
plant nutrition, influence of coarsely vs. finely ground, 183.
- Linebreeding** farm animals, progress report, 373.
- Linoleic acid**, autoxidation, factors influencing, N.Y. State 147.
- Linseed**—
oil, fatty acid composition, relation to iodine number, 463.
shortening, flavor reversion, elimination by heat polymerization and segregation of oil, 611.
- Lipide(s)**—
amine-aldehyde products in dehydrated egg, determination, 775.
composition of rat, influence of age and diet, 738.
composition of rat tissues, effect of growth, 738.
in honey bee control central nervous system, 230.
yeast from soils producing, 25.
- Liponyssus**—
bacoti, ecto-parasite of laboratory animals and control, 522.
geomydis n. sp. from pocket gopher, description, 369.
sylvitarum, control by DDT, 544.
- Lipotropism and growth**, I, dietary requirements of methionine, cystine, and choline, 738.
- Lipovitellin**, egg yolk lipoprotein, preparation, 809.
- Apoxidase**, purification, decolorization test, and activator, 614.
- Listerella monocytogenes***, goat infection, clinical and laboratory study, 104.
- Liver(s)**—
coccidiosis prevented by sulfasuxidine, 387.
fat, effect of dietary proteins and amino acids, 737.
fatty, in rats, resistant to action of choline, dietary production, 594.
fluke, common, removal from sheep by hexachlorethane-bentinitie suspension, 856.
telang, nutritional value, 423.
- Livestock**—*see also* Animals; *specific kinds*.
breeding, progress report, U.S.D.A. 41.
cobalt deficiency disease, in Australia, 169.
diseases, research progress reports, U.S.D.A. 99.
feeds, green supplements in, 90.
pests, control by DDT, 839.
poisoning by—
Crotalaria spectabilis in Louisiana, 241.
Phyllanthus, 101.
sulphur in combination with protein concentrates, 854.
production—
principles book, 89.
research progress reports, U.S.D.A. 90.
pure breeds, gene frequency changes caused by chance, 799.
- Livestock-judging** courses, examination, 410.
- Living conditions**, rural—
construction of opinion scales, [N.Y.] Cornell 119.
opinions of university women, [N.Y.] Cornell 119.
- Loader**, field, one-row mechanical for sacked potatoes, N.Dak. 722.
- Loan performances** on low income farms in Massachusetts, Mass. 406.
- Locker plants**—*see also* Food(s), frozen.
frozen-food, community, processing instructions, 271.
frozen-food, sanitization, 127.
- Locust(s)**—
Australian plague, outbreak areas and years, ecological characteristics, 352.
campaign, use of transport and poison bait, 533.
in Western Australia, 686.
Karrula paradoxa n. gen. and sp. from S. Africa, 80.
swarms, note, 80.
- Locusta migratoria***, swarms, note, 80.
- Loganberry**, dry berry disease, blackberry leaf mite role, 77.
- Lonchocarpus***—
comparison, toxicological, with *Derris*, 832.
rotenone test, 14.
- Long-horned beetles** of Ohio, identification, 831.

- Longistriata caudabullata* n. sp., new nematode from short-tailed shrew, 683.
- Loose smut—see Smut, loose.
- Lophortyx californica*, management in California, Calif. 76.
- Lotus*—
corniculatus—see Trefoll, birdsfoot.
 spp., self- and cross-fertility relationships, 185.
- Louisiana Station—
 notes, 445.
 report, 1945, La. 906.
- Louisiana University, notes, 445, 607.
- Louping-ill, studies, I, cultivation of virus in vitro, II, pathogenic properties of culture virus, 393.
- Louse powder of British Army, original, A.L. 63, 543.
- Lucilia cuprina*, copper distribution and content, 541.
- Lupines, blue, emergence and survival, effect of planting depth, 513.
- Lupines, sweet, in U.S., preliminary information, 660.
- Lupinus albus*, growth as influenced by sulfonamides and para-aminobenzoic acid, 183.
- Lupinus albus*, stem tips and subadjacent regions, development in sterile culture, 641.
- Lygus*—
 bug injury of lima bean in California, 675
 bugs, seed pitting of lima bean, 691.
 effect on alfalfa seed production and control by burning, 224.
- Lymphadenopathies, canine neoplastic, 105.
- Lymphocytoma in cow, 387.
- Lymphomatosis in fowl, transmission, 567.
- Lyophil process, yeasts preserved two years by, viability, 321.
- Lysine, bioassay by use of mutant of *Neurospora*, 620.
- Lysine, in protein hydrolysates, microbiological assay, 15.
- Machinery—see also specific kinds.
 for control of apple scab, 827.
 haymaking, in western Nevada, Nev. 573.
 rotary tillage—
 beginnings, 571.
 use, 571.
- Machines for grass seed harvesting, cleaning, and processing developed by S.C.S. of U.S.D.A., Okla. 728.
- Macracanthorhynchus hirudinaceus* in Sciuridae, new records, 522.
- Macrocentrus ancyliuorvus*—
 cocoons, separation from tuber worm pupae, factors, 535.
 sex ratio, control, 835.
- Macrophoma zeae*, as *Physalospora zeae* stage, 65.
- Macrosporium* sp., cause of seedling disease of flax, N.Dak. 210.
- Magnesium—
 chemical relationship to potassium in organic and sandy soils of Florida, 787.
 content of meats, 272.
 deficiency, peanuts, associated with leaf-spot, 339.
 specificity for growth of *Aspergillus niger*, 644.
- Maple, blood parasites of eastern Washington, 525.
- Maine, climatic divisions, 474.
- Maine Station, notes, 288.
- Maine University, notes, 288.
- Maize—see also Corn; *Zea mays*.
 diploid and tetraploid, pollen tube establishment, comparative rates, 798.
 ear, study methods, 323.
 growth, indeterminate, inheritance, 649.
 in Mexico, preliminary survey, 658.
 seeds, electromotive forces, growth correlates, 640.
- Malacosoma disstria*, diapause and egg hatching, Minn. 225.
- Malaria(s)—
 and *Anopheles*, in Northwestern States, 86.
 avian—
Aedes lepidus as vector, 87.
 nutrition studies III, IV, 248.
 streptomycin effects, 107.
 chemotherapy, study by means of yellow-fever mosquito, 227.
 chicken, increased parasitemia following X-irradiation, 249.
 control—
 brief contributions on, 86.
 by pyrethrum spraying in India, 698.
 in Tennessee Valley, water level relationships of plants, 541.
 imported, transmission by California anophelines, 228.
- Mallophaga* on rodents, descriptions, 88.
- Malt, barley, amylase content, determination, modified methods, 473.
- Malt, for alcohol production from wheat, evaluation, 166.
- Maltose—
 assay in presence of glucose, 16.
 values, effect of wheat variety, 813.
- Mamey seed, insecticidal principle, chemical nature, 296.
- Mammals—
 helminth parasites in western Massachusetts, 830.
 of Northern Great Plains along International Boundary in Canada, 682.
 plague distribution in United States, 350.
 small—
 censuses in Wisconsin, 75.
 population measurement, analysis of methods, 520.
- Welaka, Putnam County, Florida, 219.

- Mammary gland**—
 bovine, penicillin (infused) effects, 102, 392.
 thiouracil effects in rat, 46.
 tissue, carbohydrate metabolism in vitro, II-III, 383.
- Mammillaria** handbook, with descriptions, illustrations, and key to species, Cactaceae, 484.
- Manganese**—
 assay of large amounts, modified persulfate method, 12.
 deficiency in plants, detection by tetramethyldiaminodiphenylmethane, 509.
 intake, influence on urea excretion, 887.
 supplement for high wheat poultry rations, 708.
 toxicity affecting crops on acid soils, 509.
- Mango(es)**—
 ascorbic acid content, relation to variety, 747.
 Haden, flower formation in axillary buds, inhibiting effect of terminal bud, 403.
 vapor-heat treated, Mexican fruit fly mortality, 84.
- Manihot utilisima**—see *Tapioca*.
- Mannitol**, presence, titration of boric acid, 300.
- Manostat** fluids, di- and triethylene glycols, 770.
- Manure(s)**—
 cow, effect on egg production and hatchability, 95.
 effect on crop yields and composition, 173.
 losses on Colorado farms, reduction, Colo. 177.
- Maple**—see also *Sirup*, maple.
 cream, preparation factors, N.Y. State 413.
 sugar, sap-flow mechanism, 36.
- Mares**—
 brood, infectious anemia, 719.
 infectious abortion, etiology, 719.
- Margarine**, butterfat vs., in Sherman diet B, effect on growth and reproduction of rats, 129.
- Marine**—
 cables, bacterial corrosion, prevention, 32.
 microbiology, book, 30.
 organisms, sedentary, attachment and growth, season at Lamolne, Maine, 351.
- Marketing**, experimental, of strawberries and peaches, Ohio 816.
- Marmalade**, ascorbic acid retention during preparation and storage, 432.
- Marmor**—
laesiofaciens, purification and crystallization, 71.
phascoli—see *Bean mosaic virus*, common.
- Marsh**, salt, drainage by pump installation, 86.
- Maryland Station**, notes, 288.
- Maryland University**, notes, 288.
- Mash**, conversion to gallonage of "percentage concentration" of beer or, 166.
- Masonry**, handbook, 108.
- Massachusetts College**, notes, 445.
- Massachusetts Station**—
 notes, 445.
 report, 1945, Mass. 437.
- Mastitis**—
 bovine—
 intramammary therapy, 391.
 staphylococcal, use of penicillin in peanut oil with beeswax, 561.
 studies, III, penicillin therapy in streptococcal mastitis, 391.
 treatment with penicillin, 561.
 caused by injury, 717.
 control—
 by penicillin, 245.
 informative account, 103.
 plan in Tennessee, 392.
 detection in New Zealand dairy herds, V, 244.
 infectious, study I, Penicillin as therapeutic agent, 244.
 penicillin—
 dosages, 855.
 therapy, 854.
 staphylococcal, effect on plate counts of milk, 98.
 streptococcal—
 penicillin therapy, 391.
 review of literature, 392.
 treatment by intramammary infusion, concentration of penicillin in fore milk following, 562.
- Mauritius**—
 cyclones, three in 1945, effects, 476.
 economic entomology, twenty-five years, 352.
- Mayflies**, Florida, new species, 830.
- Meadow**, mountain, range condition in eastern Oregon and Washington, estimation, U.S.D.A. 501.
- Meals**, simple, time savers, Miss. 736.
- Meat(s)**—see *Animal(s)*, meat.
 canned, thermal processing, bacteriological studies, 268.
 dehydration—
 by drum-cabinet, retort-cabinet, and other methods, 414.
 by vacuum-rotary, plate-vacuum, and kettle-cabinet methods, 414.
 emergency research, processing equipment used by U.S.D.A., 414.
 in diet of pregnant women, 885.
 loaves, ground pork, cereal-extended, palatability, 410.
 magnesium content, 272.
 production and consumption in war and peace, U.S.D.A. 260.
 products, research progress reports, U.S.D.A. 121.
 quality in meat products, factors, 121.
 research progress reports, U.S.D.A. 121.
- Mechanics**—
 farm, text and handbook, 722.
 home, handbook, 108.

Media—

dispenser, simple automatic, 299.
fermented, citric acid assay in, 14.

Medic, black, strains, ecological and morphological characteristics, 810.

Medical care, prepayment, in Nevada County, Ark., 875.

Medicine, veterinary, role of disinfection, I, Sterilization of surgical instruments, 386.

Medicine Bow Mountains, ecological reconnaissance, Nebr. 219.

Melanoplus nymphs of Manitoba and adjacent areas, identification, 352.

Memnoniella, vitamin requirements, 484.

Menopon gallinae—see Shaft louse.

Menthol in peppermint oil, determination with acetic anhydride and pyridine as reagent, 777.

Menyanthes trifoliata, *Physoderma menyanthis* parasitizing, 60.

Mercuric naphthenates, value as wood preservatives, 519.

Meredith's actinomycete, *Fusarium oxysporium oudense* inhibited by, 60.

Meristematic tissue, curly-top virus occurrence, 515.

Metabolism studies, new type glass cage, 373.

Metallic elements in food and feces, spectrographic determination, 304.

Metalworking, handbook, 108.

Metamorphosis of insects, concealed phases, 685.

Meteorological—
installations, radio-interference reduction, 166.

series, periodicity, evaluation, 309.

Meteorology—

dynamic, textbook, 308.

of Columbia, yearbook 1937-43, 23.

punched cards, early uses, 629.

teaching in colleges and universities, 308.

Methionine—

determination—

by differential oxidation, 773.

by rapid procedure, 301.

in proteins and foods, 773.

in chick rations, growth response to, 94.

Methyl—

acetoxypropionate, methyl acrylate prepared by pyrolysis of, 146.

acrylate, preparation by pyrolysis of methyl acetoxypropionate, pressure effects, 146.

bromide—

control of European corn borer at low temperature, 356.

delousing agent, 365.

determination by modified ethanolamine hydrolysis method, 152.

fumigant, tolerance of citrus fruits, Calif. 538.

fumigation chamber, construction and operation, Ala. 684.

groups, carbon-linked, assay, 14.

lactate, preparation by alcoholysis of lactic acid polymers, 146.

Methyl—Continued

oleate—

catalytic air oxidation, 4.

polymers, characterization, 4.

purification for use as chemical intermediate, 463.

12-hydroxy-9,10-octadecenoates, anomalous behavior in rapid iodine number determinations, 772.

vinyl ketone from methylvinylcarbinol, 767.

Methylene blue reduction by raw milk, influence of time and storage temperature, 713.

N¹-Methylnicotinamide—

chemical determination and urinary excretion, 159.

estimation, rapid field method, 624.

excretion by normal individuals, 430.

fate in man, 745.

Methylvinylcarbinol, methyl vinyl ketone from, 767.

Mexican—

bean beetle, control by Dithane, 81.

bean beetle, control, synergistic action of N,N-diethylpiperonylamide and pyrethrum marc in, 81.

fruit fly, in mangoes, mortality in vapor-heat treated, 84.

leafhopper, *Costamia venosa* n. g. and n. sp., description, 534.

Mexico—

cooperation with U.S. in control of pink bollworm of cotton, 535.

flag smut of wheat, 511.

maize, characteristics, 658.

Mice—

adult female, mitotic activity, relation to oestrous cycle, 652.

agouti series, "snow belly" double allele in, genetic analysis, 44.

field, in mixed prairie in Kansas, 220.

rates produced by selection, growth and rates compared, 188.

resistance, genetic, to mouse typhoid, irradiation effects, 497.

typhoid, genetic resistance, physical basis in constitution of liver and spleen, 326.

Michigan College, notes, 288, 445, 607.

Michigan Station, notes, 288, 445, 607.

Microbiological assay, of—

amino acids, 14.

lysine in protein hydrolysates, 15.

tryptophan in blood, 15.

Microbiology, marine, book, 30.

Microclimatic factors, sampling methods, design and analysis, 628.

Micrococcus lysodeikticus, oxidation of acetyl phosphate and other substrates, 464.

Micromonospora propionici n. sp., cellulose-decomposing, from termites, 31.

Micro-organisms—

effect on soil aggregation, 171.

gram-positive, effect of unsaturated fatty acids, 295.

Micro-organisms—Continued

- growth factors, 157.
- resistance of treated cotton fabrics, 604.
- sterilization methods, 99.
- sucrose synthesis and utilization, mechanism and significance, 31.
- sugar utilization, rare forms, 178.
- thermal death points, relation to pasteurization time, Mich. 99.
- vitamin B complex in, 157, 158, 159.
- vitamin B₆ group, 157, 158.
- Microphallus* sp., on raccoon, 682.
- Microphotography, aid to identification of trombiculine larvae, 355.
- Microscope—*see also* Ultramicroscope.
 - multiple light source, 755.
 - techniques of use, book, 11.
- Microscopy, electron, shadow-casting technique, 757.

Microspheera alni—

- conidial germination, mechanism, 61.
- two new species in China, 209.

Middle East—

- agricultural development, report, 911.
- rural education and welfare, 876.

Midges, Iowa, life histories and ecology, I, *Tanytarsus*, 534.**Migration, trans-Gulf, evidence, 522.****Migratory locust, note on swarms of, 80.****Mildew—**

- downy, resistant cucumbers, development, S.C. 815.

powdery—

- fungi, conidial germination, mechanism, 60.
- fungi of China, taxonomy, 209.
- of broad bean, caused by *Erysiphe polygoni* in Yunnan, China, 337.
- of cantaloups, fungicidal control, Calif. 343.
- perithecia on zinnia seed, 347.
- resistance of textiles, 899.

Milk—*see also* Pasteurization.

- and egg dehydrated mixtures, keeping quality, 415.
- bottles, square and round, cleansing, 239.
- butterfat content, variation, causes, 714.
- colostrum, vitamin contents in cow and ewe, 98.
- condensed—
 - and milk powder, book, 558.
 - sucrose and lactose content, 304.
- costs of production in N. E. Mississippi, Miss. 870.
- denaturation, effect on oxygen, vitamin C, and oxidized flavors, 555.
- diacetyl production by betacocci, effect of acidity, 554.
- dried, bacterial counts, stain for direct method, 11.
- dried—
 - containers, packed in nitrogen, oxygen content, 386.
 - research, 557.
 - enzyme, light-sensitive, 239.

Milk—Continued

- evaporated, storage effects on acids and formal titrations, 7.
- fall shortage, problem in price adjustment, [N.Y.] Cornell 730.
- fat—
 - autooxidation rate in different oxygen concentration, 384.
 - fractionation from solvent at low temperatures, 457.
 - glycerides, distribution pattern of fatty acids, 384.
 - nutritional studies, I, II, feeding glycerides to rats, 555.
- fever, comparison with ketosis, 554.
- films, detergents and procedures, measurement of detergency functions by washing machine, 851.
- flavor—
 - judgments, time required, 851.
 - "oxidized" and "goaty," effect of cod-liver oil, 554.
 - oxidized, effect of denaturation, 555.
 - sediment role, 98.
- fluorine content, effect of treated drinking water, 273.
- food values under cream layer, 265.
- from quarters reacting to bromothymol blue test for mastitis, composition, 244.
- heated—
 - formic acid content, determination, 145.
 - lactic acid assay, Mich. 7.
- homogenized, contamination—
 - by raw milk, detection, Mich. 622.
 - by raw milk, tests, 851.
- human, studies, XIX-XXVII, 265.
- hypochlorite effects on bacteria and chemistry of, 8.
- keeping quality, tests, 385, 554.
- mare's, vitamin content, 240.
- market, pathogenic bacteria incidence in Cairo, 393.
- nutrients, balance in making of cheeses, and fate during ripening, 556.
- pasteurization, high-temperature short-time methods, papers listed, Mich. 99.
- powder(s)—
 - and condensed, book, 558.
 - Australian, keeping quality, 385.
- preservation, effect of—
 - penicillin, 852.
 - streptomycin, 852.
- price adjustment problem, Pa. 581, [N.Y.] Cornell 730.
- production—
 - feed cost, variation between breeds, 552.
 - six thousand pounds per acre, La., 238.
- quality—
 - control for manufacturing purposes, 851.
 - effect of route delivery, 714.
- rancidity, research since 1726, 714.
- raw, bacteriological quality, effects of transport and storage, I, 713.
- raw, reduction of methylene blue, influence of time and storage temperature, 713.

Milk—Continued

- route delivery, effect on flavor, riboflavin, and ascorbic acid content, 714.
- sanitation, papers, 713.
- secretion, treatise, third ed., 383.
- skim, separation temperature and heat treatment, relation to keeping quality of ice-cream mix, 558.
- solids—
 - content in South Africa, 553.
 - dry, bread making quality, 411.
 - dry, effect on bread volume, 306.
 - total, calculation by Sharp and Hart equations, 617.
- staphylococcal mastitis effect on plate counts, 98.
- sterilization methods, 99.
- supply, relation to control of brucellosis in New York State dairy herds, 716.
- thiamine content, determination, simple fluorometric method, 470.
- vitamin A potency in Louisiana, La. 891.
- whole, powder—
 - compressed, studies, 385.
 - stability, 415.
- vitamin C content—
 - effect of deaeration, 555.
 - effect of feeding cod-liver oil, 554.

Milking barn, walk-in type, Nev. 578.

Milkweed—see *Asclepias syriaca*.

Millet, as green feed supplement for livestock, 90.

Milo—

- history and evolution in U.S., 810.
- laboratory and greenhouse studies, 334.

Mineral(s)—

- fluorine content, assay, 19.
- in plant samples contaminated by grinding, 150.
- nutrient deficiencies of citrus trees, 217
- resources, book, 143.
- soil, influence on insects, 532.
- supply, effect on mineral concentration and nutritional quality of plants, 632
- trace, functions, deficiencies, and excesses, book, 29.

Mink, tail mite, control by Hy-Kresol dip, 88.

Minnesota Farm and Home Science, 1946, Minn. 606.

Minnesota Fruit Breeding Station, introduction of three new fruit varieties, Minn. 331.

Minnesota Station—

- notes, 144.
- report, 1945. Minn. 438.

Minnesota University, notes, 912.

Mississippi Farm Research—

- January 1946. Miss. 287.
- February 1946, Miss. 756.
- March-April 1946, Miss. 910.

Mississippi River Basin, lower, stream flow measurements, 1944, 399.

Missouri Station—

- notes, 758.

Missouri Station—Continued

- report—
 - 1942-43, Mo. 439.
 - 1944, Mo. 439.

Missouri University, notes, 758.

Mite(s)—

- infesting fungus cultures, biology, classification and control, 698.
- new *Laelaps aplodontiae*, from *Aplodontia*, 369.

on mink, control by Hy-Kresol dip, 88.

six new, of superfamily Parasitoidea, 369.

Mitosis, respiration correlation in plants, 37.

Moisture—

- absorption, measurements, accelerated method, 12.

in arid soils, effect on dissolved and exchangeable ions, 171.

soil—see Soil moisture.

stress on roots in container of saline soil, evaluation techniques, 171.

Molasses, blackstrap, constituents, isolation by chromatographic methods, 351.

Molasses-beet pulp, cattle fattening by, Wash. 91.

Mold(s)—see also specific kinds

- bread, spores, ultra-violet irradiation, 323.
- growth—

- inhibitors, II, active agent responsible for inhibitory effect of propionates, 612.

- on leather, 900.

- relation to deterioration of corn in storage, review, 337.

Molybdenum—

- blue reaction, modified procedure, 13.
- microdetermination in plants and soils, 152.

- poisoning, chronic, in cattle, 393.

Montezia expansa, removal from sheep by lead arsenate, preliminary report, 564.

Monkey—

- antianemia factor, 600.

- ascorbic acid deficiencies, 283.

- riboflavin requirements, and new factor in liver, 599.

Monochamus titillator—see Southern pine sawyer.

Monomethylaminoethanol in diet of chicks. 549.

Monthly Weather Review—

- October-December 1945, 309.

- January-March 1946, 630.

Mordellidae, monograph, 81.

Mosaic(s)—see also specific host.

- in *Nicotiana* spp., symptoms, relation to genotype and temperature, 39.

- on Leguminosae, 810.

- on winter oats induced by soil-borne viruses, 338.

Mosquitoes—see also specific name.

- adult, control in open unwooded areas by airplane application of DDT, 368.

- adult, outdoor control with DDT or pyrethrum, ground equipment, 368.

- Mosquitoes**—Continued
 anopheline, female, moonlight and house-haunting habits in West Africa, 367.
 breeding, role of aquatic vegetation, 698.
 control—
 brief contributions, 86.
 by DDT emulsion to rice-field water, 540.
 by concentrated sprays, 366.
 by DDT, 86, 366.
 in Connecticut, 352.
 corpora allata, 352.
 exposed to DDT, effect of temperature, 227.
 larvae in rice fields, airplane spraying with DDT, 87.
 malaria—
 in Brazil, 87.
 in southern Michigan, Mich. 86.
 migration in Salt Lake City, 86.
 nervous system, study by Dodlan technique, 540.
 new—
 species from New Guinea, 227.
 species from Okinawa, 87.
 to United States, *Aedes tortilis*, 366.
 of Connecticut, 366.
 of Espiritu Santo (New Hebrides), bio-nomics, 367.
 repellents, new, investigation, 228.
Motor fuels, alcohol, iron pentacarbonyl as antiknock agent in, 165.
Mouse—see Mice.
Mules, salmonellosis outbreak, 247.
Mung beans, source of protein for turkey poults, 235.
Mus musculus, adult, mitotic activity, relation to oestrous cycle, 652.
Musca domestica—see House fly.
vicina, life tables, 686.
Mushroom, cultivated, nutrition, 815.
Mustard, wild yellow, seed, concentrate for milk cows, Mont., 849.
Mycobacterium avium, pseudo-mycella developed in embryo-extract culture, 101.
Mycobacterium spp., antibiotic material from *Bacillus lichemiformis* active against, 313.
Mycosphaerella brassicicola, spermogonia versus pycnidia, 512.
Myrmidae, new genera and species, descriptions, 534.
Myosmine, chemical reactivity, 5.
Myrmecological technique, 221.
Myrmica brevinodis transversinodis n. var., new house invader, description, 355.
Myxomycete—
 morphogenic-movement rate, 38.
 protoplasm, torsion, 37.
Mysus pseudosolanii, vector of tobacco rosette, 71.
Nairobi sheep disease virus, survival in *Rhipicephalus appendiculatus*, 230.
Najas arguta in Central America and its relationship to *N. wrightiana*, 792.
Najas wrightiana, relationship to *N. arguta*, and two new subspecies, 792.
Names, generic, abbreviations, 755.
Nantucket pine moth, informatory account, 84.
Naphthaleneacetic acid—
 apple preharvest drop, effect of—
 aerosols, 50.
 application method, 51.
 effect on apple fruit maturity, 50.
 α -Naphthylthiourea—see ANTU.
Narcissus—
 leaf diseases, III, *Sclerotinia polyblastis* on *Narcissus tazetta* var. Soleil d'Or, 680.
 virus diseases, general study, 74.
National Advisory Research Committee, notes, 760.
National Poultry Improvement Plan, Directory of U.S. Register sires and dams under, U.S.D.A. 97.
Natural products, pyridoxamine and pyridoxal contents, 158.
Naval stores, water determination in, Fischer method, 150.
Nebraska Station—
 notes, 445, 758.
 report, 1945, Nebr. 907.
 Nebraska University, notes, 445, 758.
Necrosis, internal, of potato tubers caused by psyllids, 513.
Nectria ditissima, foci of infection on pear, 73.
Negro—
 American, demographic study, 264.
 population of Kentucky, Ky. 409.
 rural and urban residence in U. S., 874.
Nematode(s)—
 Acrostalagmus zeosporus n. sp. parasitizing, 75.
 cause of root nodules on zinnia, 218.
 of carnivores, annotated list of, *Phy-saloptera*, 88.
 parasites, Brazilian chytrids, 637.
Nematodirus adults, eggs, and larvae, recovery for experimental purposes, 717.
 Neo- α -carotene B, stability and activity, 615.
 Neo- β -carotene B—see also β -Carotene.
 stability and activity, 615.
 Neo- β -carotene U, vitamin A activity and its steric rearrangement in digestive tract of rats, 743.
Neolithobius, new species, description, 351.
Neoplasma, canine lymphadenopathic, 105.
Neoplastic disease of fowl, with special reference to history, incidence, and seasonal variation, 396.
Nervous tissues, as influenced by deficiencies of pantothenic acid vs. pyridoxine in swine, 104.
Neurospora—
 cholineless mutants, utilization of choline analogs, 422.
 in microbiological assays, 20.
 inheritance and nutritive needs in, N.Dak. 180.
 leucineless, reverse-mutation and adaptation, 651.
 mutant, use in bioassay for lysine, 620.

Neurospora—Continued

- riboflavin synthesis by, genetic differences in strains, 85.
- temperature-sensitive riboflavinless mutant, 85.
- tetrasperma* type, homothallic fungus species, maintenance of heterozygosity, 651.
- thiamine synthesis by, genetic differences in strains, 85.
- Neutron bombardment, fungus variation induced, 82.
- Nevada Station, notes, 445.
- Nevada University, notes, 445.
- New Guinea, mosquitoes, new species, 227.
- New Hampshire University, notes, 758.
- New Mexico Station, report, 1945, N.Mex. 440.
- [New York]Cornell Station, notes, 607.
- [New York]Cornell Station, report, 1945, 908.
- New York State Station, notes, 144, 446, 607.
- New Zealand—
 - sugar beet mosaic, 514.
 - whiptail control in cauliflower and broccoli crops, 512.
- Newcastle disease—
 - investigations in war research program, 567.
 - status in U.S., 720.
 - virus strain, modification by intracerebral passage through ducklings, preliminary, 721.
- Niacin—
 - content of dried legume seeds, 428.
 - retention in cooking pork and processing bacon, 428.
- Niadinia jauva* n. gen. and sp., description, 686.
- Nickel deficiencies in agricultural crops, 509.
- Nicotiana* spp., mosaic symptoms in genotype and temperature relations, 89.
- Nicotiana tabacum*—see Tobacco.
- Nicotinamide—
 - excretion by normal individuals, 430.
 - methochloride and its fluorescent derivatives, 280.
 - microbiological determination, 429.
- Nicotine, penetration rates in cockroaches from solutions of various pH values, 77.
- Nicotinic acid—
 - deficiency—
 - 3-acetylpyridine producing in mice, 136.
 - corn as causal factor, 135.
 - in turkey poult, and occurrence of perosis, 253.
 - excretion by normal individuals, 430.
 - influence on response of chicks receiving diet high in corn, 549.
 - low-level diet, effects on man, 136.
 - low-level rations, folic acid importance in dogs on, 135.
 - microbiological determination, 429.
 - of fish from Michigan waters, lake herring, carp, suckers, and burbot, 744.

Nicotinic acid—Continued

- of tea, 280.
- requirements of dog, as influenced by corn grits, 135.
- requirement of chicks, influence of gelatin and tryptophan, 549.
- retention in preparation of overseas hams and bacons, 279.
- water-insoluble esters and amides, preparation and value, 6.
- Nicotinic acid—
 - excretion by normal individuals, 430.
 - microbiological determination, 429.
- Nigeria, Northern, bovine helminths, 245.
- Nitidulid beetle, new species, 365.
- Nitrates—
 - in plants, occurrence and assimilation, 183.
 - microdetermination, Devarda method, 151.
 - nitrogen nutrition, influence on development of hypocotyledonary buds of flax, 322.
 - utilization by coffee plant under different sunlight intensities, U.S.D.A. 203.
- Nitrites, colorimetric determination, 770.
- Nitrogen—
 - conservation in soil—
 - influence of time and plowing under legumes, 191.
 - legume management factors, 27.
 - content of leaf tissue, determination, by micromethods, 301.
 - determination by Kjeldahl method, catalytic activity of selenates in, 151.
 - effect on quality—
 - and yields of peas, N.Y. State and Cornell 330.
 - of peas, 877.
 - fertilizer—
 - effect on semiarid soil, 786.
 - for corn and oats, placement, Miss. 633.
 - fixation by soybeans, effect of straw and nitrogen, 811.
 - in pyridine ring-type compounds, determination by Kjeldahl method, 301.
 - metabolism in barley seedling, aspects, relation of early growth to, 316.
 - metabolism in corn, influence of ammonium nutrition, 794.
 - nitrous, losses from soils on desiccation, 479.
 - nutrition, in onions, influence on susceptibility to yellow-dwarf virus, 216.
 - requirement in utilization of carbonaceous residues, in soil, 480.
 - simple compounds, utilization by ruminants, 231.
- Nitrogen, soil, injury to spinach, 225.
- sources, effect on soil reaction, exchangeable ions, and yields of crops, 786.
- thiocyanate, assay in organic thiocyanates and mixtures, 14.
- Nitroparaffins—
 - amylopectin separation, 15.
 - amylose separation, 15.

- Nodule(s)**—
bacteria—
 and clover, symbiosis, genetic factors, 651.
 antibiotics from *Aspergillus wentii* against, 30.
 factors influencing root penetration, 34.
 legume, pigments in, 34.
 Nomograph for calculation of over-all heat transfer coefficients, 802.
 Nordihydroguaiaretic acid—
 antioxidant properties, 465.
 stabilization of carotene, 466.
 Norelac, new synthetic coating material, 466.
 North Carolina research and farming, 1946, N.C. 756.
 North Carolina College, notes, 446, 608, 758.
 North Dakota College, notes, 758.
 North Dakota Station—
 Bimonthly Bulletin—
 1946, N.Dak. 756.
 January–February 1946. N.Dak. 287.
 notes, 758.
 Northern feather mite, control by DDT, 544.
 Norway, deficiency diseases of cattle and sheep, therapeutic effect of small doses of cobalt, 563.
Nutrients—
 availability, metalob calculations reviewed, 131.
 consumption by Army students at University of Missouri, 884.
 distribution in drained and liquid portions of canned vegetables, 588.
 influence of cooking processes, N.C. 884.
Nutrition—
 chemistry, textbook, seventh edition, 410.
 children, and chemical growth, 274.
 human goals, U.S.D.A. 140.
 infant, relations to diets of mothers, 127.
 men, field surveys, fasting, random, and oral loading tests, 624.
 microchemical methods of study, 127.
 new developments, 127.
 plant—see Plant nutrition.
 populations, V, vitamin C nutrition of rural population in middle Tennessee, 740.
 young people and their families, book, 418.
 relation to defense mechanism against bacterial infections in rats, 559.
 research—
 by experiment stations, progress reports (1945), U.S.D.A. 142.
 progress reports, U.S.D.A. 140, 141.
 surveys, symposium, 127.
 surveys, techniques, 127.
 Nutrition Foundation investigations on nutritive value and oxidative enzymes in dehydrated vegetables, 878.
 Nuts, tree, pollination, Wash. 202.
 Nuts, diseases in Oregon (1945), U.S.D.A. 58.
Nuttallia equi, opossums infected with piropiasm of type of, 101.
- Nyasaland, Lower River districts, cotton insect pests, status and control, 535.
Nyctobia larvae, new description, 364.
 Nylon thread, sewing, selection, Ohio 751.
Nymphalis californica, flights in British Columbia and Alberta in 1945, 354.
Oat(s)—
Avena test, variability, influence of kernel size, age, location in panicle, and variety, 485.
 blight caused by *Helminthosporium* differing from cause of leaf spot, 511.
 Delta, test, time of application of nitrogen materials, Miss. 654.
 interspecific cross, inheritance of rust reactions, etc., 41.
 leaves, metabolism in starving, 184.
 new helminthosporium disease, 334.
 nitrogen fertilizer, placement, U.S.D.A. 633.
 seed-borne disease, new, [N.Y.] Cornell 824.
 spring, Illinois-adapted varieties, Ill. 198.
 utilization by market hogs, effect of fineness of grinding, 377.
 variety (ies)—
 performance tests (1945), N.C. 192.
 reactions to four races of loose smut, 511.
 studies in Tennessee, Tenn. 660.
 winter, mosaics induced by soil-borne viruses, 338.
 Oatmeal, retention of B vitamins during cooking, 599.
 Ocelli and wings correlated in insects, 78.
Odocoileus hemionus columbianus, parasites, diseases, injuries, and anomalies in British Columbia, 682.
 Odonata, distribution and seasonal abundance in Indiana, 80.
Odontria zealandica, control by lead arsenate, 83.
 Oedogoniaceae, from Louisiana and Texas, 180.
 Ohio River Basin, stream flow measurements, 1943, 399.
 Ohio State University, notes, 608, 758.
 Ohio Station, notes, 608, 758.
Oil(s)—see also specific kinds.
 antioxidants, evaluation means by stability values obtained by different rapid methods, 471.
 antioxidants, fatty acid monoesters of l-ascorbic and d-isoascorbic acids, 462.
 bodies drying, analysis, 21.
 citrus volatile, assay apparatus, 10.
 content of soybeans, determination, effect of relative humidity, 469.
 crops, major, world trends, U.S.D.A. 405.
 crops, research progress reports, U.S.D.A. 140, 141.
 deterioration, problems of Army, 418.
 fatty acid monoesters of l-ascorbic and d-isoascorbic acids in, assay, 19.
 semidrying, analysis, 21.
 sesame, sesamin determination in, 155.

- Oil(s)**—Continued
 sprays—*see* Sprays.
 thermal properties, I-V, 455.
 thiocyanogen reagent and method, modified, 472.
 vegetable—
 extraction, continuous, countercurrent extractor, rising-film evaporator, and oil stripper, 769.
 solvent extraction from raw materials, bibliography, 457.
 solvent extraction, techniques, 147.
 solvent mixtures with, densities and viscosities, determination, 147.
 γ -tocopherol assay in, 160.
Oklahoma, new publications and list of publications available, Okla. 756.
Oklahoma College, notes, 759.
Oklahoma Station, notes, 759.
Okra, apid-resistance, test for, 81.
Oleic acid—
 adsorption analysis, technique, 155.
 purification for use as chemical intermediate, 463.
Oleyl alcohol, purification for use as chemical intermediate, 463.
Olives, home pickling, Calif. 125.
Olives, processing methods, advances in California and abroad, 884.
Olives, Russian, new disease of unknown cause, 73.
Olipidium—
 granulatum n. sp., description, 637.
 rotiferum n. sp., description, 637.
O'Neal, Edward Asbury, III, of Alabama, 757.
Onion(s)—*see also Allium cepa*.
 color-inhibiting factor, relation to smudge resistance, U.S.D.A. 216.
 diploclad rot, 344.
 investigations at Utah Station, Utah 330.
 production, book, 815.
 roots, camphor effects on, 183.
 seed heads, blasting, U.S.D.A. 58.
 smudge resistance, relation to color-inhibiting factor, U.S.D.A. 216.
 smut, control, dust fungicides versus formaldehyde, Mich. 844.
 susceptibility to yellow-dwarf virus, influence of nitrogen nutrition, 216.
 thrips, control by DDT, Ohio 361.
 varieties, reaction to yellow-dwarf virus and viruses from shallot, garlic, and narcissus, 216.
Onopordum acanthium, Duvel buried seed experiment, final results, U.S.D.A. 201.
Onotheca biennis, Duvel buried seed experiment, final results, U.S.D.A. 201.
Ontario Agricultural College—
 and Experiment Farm, report, 286.
 notes, 144.
Oodinium Umneticum n. sp., description and life history, 851.
Opossums, plasmid of *Nuttallia equi* type in, 101.
Opsonocytaphagic test in bovine brucellosis, 102.
Opuntia ammophila, fungus infestation, 680.
Orange(s)—*see also Citrus*.
 juice—
 canned, quality, 417.
 organic acids in, analysis, 154.
 navel, stubborn disease, virosis, symptoms, 828.
 trees—
 quick decline—*see* Quick decline.
 root rot or "tristeza," 347.
 Valencia, seed oil, 450.
Orchards—
 frost damage and importance of elevation and drainage, Pa. 506.
 Oklahoma, codling moth control, 537.
Orchids—
 black rot, distribution, U.S.D.A. 58.
 seeds, germination and development in asymbiotic media, action of thiamine, 485.
Orchitis in swine due to *Brucella suis*, 565.
Orcinol reagent, preparation, improvement, 616.
Organic chemical syntheses, book, 1.
Organic materials, hydroxyl content, determination by macro- and semimicromethods, 154.
Organisms, small, dispersion, 208.
Oriental cockroach, food preferences, 84.
Oriental fruit moth—
 control by DDT and Ryanex, 694.
 forecast for 1946, and control, N.Y. State and Cornell 834.
Ornithodoros delanoet actinus, biology, 230.
Ornithology, economic, 522.
Orthopodomyia alba, in Louisiana, 86.
Osteopetrosis in chickens, production by filterable agent, 396.
Osteopetrosis gallinarum, spontaneous, familial incidence, 715.
Ostertagia ostertagi, life history, Va. 857.
Ovaries, cystic, effects of chlorionic gonadotropin in cow, 392.
Ovulation frequency in hens, follicular atresia after surgery in relation to, 190.
Ovulation, in fowls, interruption by non-specific substances, 189.
Oxidation of peaches and apricots, control, 883.
Oxybiotin, determination in presence of biotin, 625.
dl-Oxybiotin, microbiological activity, 744.
Oxygen absorption, rate determination, apparatus, 299.
Oysters, spoilage of raw and canned—
 indole determination, 8.
 research report, 8.
Ozone, production, constant amount, 298.
Ozonizer capable of producing constant amount of ozone, 298.
Pabulum, synthetic, for preservation of bull semen, 800.
Pachylaelaps ornata n. sp., description, 869.

- Pachyrrhizus erosus*, insecticidal resin of, constituents, 9.
- Pachyscius inaequalis* n. sp., description, 369.
- Pachythelka villosella*, life history, 687.
- Pacific slope basins, California and Oregon, stream flow measurements, 1944, 399.
- Packaging of foods—
for postwar marketing, U.S.D.A. 126.
gas penetration rate—
determination, 149.
measurement, 126.
- Painting and decorating, handbook, 108.
- Palafolia* genus in Texas, 181.
- Palestine, Jewish agriculture, 757.
- Palm oil, stability, effect of metallic salts, 457.
- Pantothenic acid—
content of eggs, effect on amount in newly hatched chicks, 378.
content of tea, 280.
deficiencies of pyridoxine vs., effect on nervous tissues of swine, 104.
excretion, effect of pantothenic acid dosage and temperature and humidity, 741.
metabolism and lactone moiety in man, 601.
microassay, by *Lactobacillus arabinosus* 17-5, 160.
relation to *Plasmodium gallinaceum*, 387.
- Papaya bunchy top transmission by leaf-hopper of genus *Empoasca*, P.R.U. 217.
- Paracolus*, new species, descriptions and key, 353.
- Paracolon, type 10—
bacillus, isolation from adult turkey, 568.
occurrence in turkeys, 568.
- Paramecium, polyploid races, chromosome counting technique, 494.
- Parasites, internal, occurrence in animals in Mississippi, preliminary study, 715.
- Parasitoida, six new mites, 369.
- Parutetranychus pilosus*—see European red mite.
- Parthenium*—
argentatum—see Guayule.
morphology of reproduction, 324.
spp., hybridization among, 39.
- Parthenocarp and accompanying hormonal syndromes induced by unrelated chemicals, 639.
- Paspalum notatum*—See Bahia grass.
- Pasteurella multocida* infection in wild ducks, treatment, 398.
- Pasteurella*, new strains, description and outbreak in wild ducks, 398.
- Pasteurellosis, outbreak in wild ducks, 398.
- Pasteurization—
H.T.S.T. process, temperature control, 554.
high-temperature short-time methods, papers listed, Mich. 99.
high-temperature vacuum, extension of Vacreator process, Oreg. 852.
- Pastry batters, freezing before baking, 124.
- Pasture(s)—
bluegrass, yield, estimation by clipping vs. grazing of dairy helpers, 850.
crested wheatgrass for, Oreg. 112.
dry-land, at Central Mountain Branch Station, Moccasin, Mont., 501.
fertilization tests, 192.
for swine, advantages in feed and profit, Mich. 704.
grasses and legumes for, summary of research (1902-45), Alaska 190.
improvement for northeastern U.S.A., U.S.D.A. 192.
permanent, higher yields, trials, Minn. 328.
research progress reports, U.S.D.A. 140, 142, Ala. 143.
ungrazed, succession, quantitative study, 182.
utilization, maximum, by steers, Mich. 703.
yields, measurement with grazing cattle, proposed method, 373.
- Pea(s)—
aphid—
attack, alfalfa, ordinarily susceptible, temporary immunity, U.S.D.A. 822.
control by insecticidal aerosols, II, 692.
resistance to DDT, 692, 693.
canning, production costs, and returns, Wis. 726.
chemical composition of seed vs. canned, 7.
cull. for fattening hogs in dry lot, Idaho 705.
cull, protein supplement for fattening hogs, Idaho 92, 377.
emergence and yield, effect of seed treatment and seeding dates, 676.
freezing, rate, effect on appearance, palatability, and vitamin content, 880.
fresh green, ascorbic acid content, determination, 623.
frozen, vitamin retention in quantity food service, 889.
quality effect of nitrogen, N.Y. State and Cornell 330, 377.
seedlings, growth inhibition by urine extract, 639.
starch, amylose content, 450.
vitamin content, effect of freezing, canning, and dehydration, 891.
weed control by chemical sprays, Mich. 49.
weevil, informatory account, U.S.D.A. 83.
yields, improvement by nitrogen, N.Y. State and Cornell 330.
- Peach(es)—
bacterial spot and behavior in Delaware, Del. 678.
blotch, symptoms, 217.
browning, prevention by ascorbic acid, Ga. 735.
canning, 1946 demand situation, statistics, Calif. 873.
carotenoids, effect of processing, S.C. 891.
cat-facing and dimpling, causes, 695.
catalase of leaves, variations in lime chlorosis, 73.

Peach(es)—Continued

- "counter-sizer," description and operation, N.C. 577.
- deformed, sucking bugs causing, control by DDT, 537.
- fruitfulness relations to pollen grain morphology and physiology, Del. 52.
- growth and yield as influenced by culture practices, 51.
- marketing, experimental, Ohio 816.
- oxidation, control, 883.
- peeling, lye solutions, addition of wetting agents, S.C. 883.
- production, economic study in Louisiana, La. 114.
- seed, after-ripening needs by source and variety, 51.
- tree(s)—
 - borer control in Delaware, Del. 694.
 - in sand culture, tops, growth and composition, W.Va. 202.
 - spraying with DDT, 695.
- varieties, breeding and improvement in New Jersey, N.J. 816.
- vitamin C content, effect of processing, S.C. 891.
- wart, transmission by graft inoculations with affected fruit tissue, 827.

Peanut(s)—

- absorption of calcium from kaolin and bentonite at varying levels of calcium, 787.
- butter, improvement by changing flavor and texture, 413.
- butter quality, improvement, 266.
- farmers' stock, U.S. standards, analyses of peanut kernels for, 459.
- kernels, analyses for U.S. standards for farmers' stock peanuts, 459.
- kernels, moisture content, determination, 617.
- leaf spot associated with magnesium deficiency, 339.
- oil(s)—
 - antioxidants, molecularly distilled, stabilizing agent for fats of poor keeping quality, 460.
 - hydrogenated, viscosities and densities, 460.
 - solvent extraction, techniques, 147.
- protein hydrates—
 - preparation and properties, 163.
 - use as tacky and remolstening adhesives, 164.
- protein-solution viscosity patterns, methods and comparisons, 2.
- proteins—
 - color, improvement, 764.
 - electrophoretic investigations, I, II, 763.
- seed treatment tests, 335.

Pear(s)—

- boron deficiency, symptoms and control, 678.
- catalase of leaves, variations in lime chlorosis, 73.
- cold storage design, 577.

Pear(s)—Continued

- nectria canker, foci of infection, 73.
- organoleptic tests, 735.
- production costs in Hood River Valley, Oreg. 118.
- pylla control in 1945, 363.
- scab, conidial pustules and role as nectria canker foci, 73.

Pecan(s)—

- effect of chloride, Okla. 204.
- nut casebearer, control, timing spray applications, 538.
- nutritive value, Ariz. 122.

Pectin(s)—

- alkaline de-esterification, acceleration by electrolytes, 5.
- and pectinol A activities on other substances, 5.
- in gel powders, dispersibility due to sugars, 413.
- methyl ester content, determination, 302.
- thermal degradation, 294.
- Zeisel methoxyl values for, errors from retained alcohol, 154.

Pectinol A, effect on pectin and other substances, 5.**Penicillin—**

- absorption, agents for delaying, efficiency, 388.
- activity, relation to bacterial spores and preservation of milk, 852.
- concentration in fore milk following intramammary infusion for mastitis, preliminary report, 562.
- dosage and blood levels for horses, 566.
- dosages for *Streptococcus agalactiae* mastitis, 855.
- elaboration and liberation by *Penicillium notatum*, 483.
- enzymes tested against, 32.
- fermentations with *Penicillium chrysogenum* X-16-12, effect of environmental conditions, 792.
- in peanut oil with 3 percent beeswax, local use in bovine staphylococcal mastitis, 561.
- infused, effect on bovine mammary gland, 102.
- infusion in bovine mammary gland, effects, 392.
- mastitis control, 245.
- microbiological aspects, IV, production in submerged cultures of *Penicillium notatum*, 636.
- pharmacology, aspects, 854.
- production—
 - by superior strain of mold, 636.
 - in submerged cultures, 33, 483.
 - in surface cultures, 33.
 - role of corn steep liquor, 612.
- submerged fermentation on synthetic media, metabolic changes, 314.
- supplies from Wisconsin research, Wis. 814.
- therapeutic value for infectious mastitis, 244.

Penicillin—Continued therapy—

- bacterial infections, 853.
- in fatal case of equine tetanus, 395.
- in mastitis, 854.
- in strangles, 100.
- in streptococcal mastitis, 391.

treatment of—

- bovine mastitis, 561.
- acute equine infectious anemia, 247.
- Pasteurella multocida* infection in wild ducks, 398.

Penicillin-producing strains of *Penicillium notatum-chrysogenum*, comparison, 792.

Penicillin X, production in submerged— culture 791.

- surface cultures, 636.

Penicillinase—

- Bacillus cereus* producing, 32.
- bacterial, production, nature, and significance, 30.

Penicillium—

chrysogenum—

- strain 62078, X-ray produced mutant, desthiobiotin study, 615.
- strain X-16—12, penicillin fermentations, effect of environmental conditions, 792.

gladioli, metabolic product, antifungal and antibacterial, gladiolic acid, 637.

notatum—

- antibiotic potency varying with strains, 180.
- bacteriostatic action in surface culture, relation to production of CO₂, 636.
- cytology, 38.
- elaboration and liberation of penicillin, 483.
- penicillin production in submerged cultures, 33.
- pleomorphism, 180.
- variation induced by bombardment with neutrons, 32.

notatum-chrysogenum, penicillin-producing strains, comparison, 792.

- rots of citrus and apple fruits, 217.

Pennsylvania College, notes, 446.

Pennsylvania Station, notes, 446.

Peppergrass, perennial, insect community on, in southern New Mexico and southwestern Texas, 830.

Peppermint oil, menthol content, determination with acetic anhydride and pyridine as reagent, 777.

Pepsin, tyrosine iodination in, 3.

Peptone, charcoal-treated, use in microbiological assays, 616.

Perch migration, chart, 525.

Pericarp, seed relation to fruit growth and ripening, 38.

Periplaneta americana—see American cockroach.

Perishables—see Agricultural perishables.

Peronoplasmodium cubensis, cucurbit resistance to, test for, 81.

Perosis caused by feeding high levels of thiouracil, 567.

Perosis in turkey poults, 253.

Peroxidase, efficacy in dehydration, quick test, 271.

Peru, broadbean disease due to *Phoma* sp., 671.

Pest(s)—

- agricultural, control by heat-generated aerosols, preliminary studies, 78.
- control, United States patents, review, U.S.D.A. 222.
- insect, of animals and man, DDT tests summarized, 85.

Petroleum—

- cooperatives, affiliated with Southern States Cooperative, Inc., delivery efficiency, U.S.D.A. 408.
- delivering to farmers efficiently, U.S.D.A. 408.
- oil spray deposits on citrus leaves, determination, 305.

Petunia, double fertilization in, 41.

Peuceletia viridans, poison-squirting, 351.

Pharmaceutical products, vitamins in, availability determination, methods, 424.

Pheasants in Wisconsin, 682.

Phenylalanine, determination by rapid procedure, 301.

Phenol, reaction with colon bacillus, temperature coefficient by new technique, 101.

Phenols, toxicity to *Colletotrichum circinans*, effect of pH, 821.

Phenolic—

- compounds, biological activity, 242.
- fungicides, quantitative determination, 778.

Phenology, in British Isles (Dec. 1944–Oct. 1945), 169.

Phenothiazine—

- action on gastrointestinal strongyles of sheep, 394.
- administration methods for sheep, 104.
- anomalous experience, 388.
- as anthelmintic, 101.
- cause of abortion in sheep, 246.
- control of cecal worms and blackhead disease of turkeys, limitations, 569.
- efficacy in treatment of sheep for internal parasites, 246.

Phenyl ethyl butyrate, attraction for Japanese beetle, 687.

Phenylacetic acid, histological responses of bean plants, 319.

Phialea temulentia, blind-seed disease of grasses due to, 69.

Philippine Islands, agricultural geography, graphic summary, U.S.D.A. 262.

Phlebotomus, new species, descriptions, 700.

Phlebotomid leafhopper vectors of California aster yellows virus, Calif. 363.

Phlox drummondii, developmental changes in apexes of mature, 38.

Phomopsis fruit rot of eggplants, control, N.J. 676.

- Phoniomyia hireuta*, n. sp. from Jamaica, 228.
- Phosphatase test, of Cheddar cheese, 20.
- Phosphate—
adsorption in Illinois soils, 175.
rock, defluorinated, phosphorus supplement to rations of dairy cattle, 712.
soil retention, 176.
- Phosphorus—
content of dehydrated green beans, effect of blanching, storage, and cooking, 276.
content of leaf tissue, determination by micromethods, 301.
determination, modified molybdenum blue procedure, 13.
- In—
limestone, determination by photometric method, 151.
poultry nutrition, II, 551.
soybean oil meal, availability for rat, 596.
soybean oil meal, utilization, enzymatic relationships, 596.
wheat starch, extraction, 3.
- Inorganic, determination in plant materials, 773.
- radioactive, absorption by barley roots, 36.
- Photocolorimetry, test, modified Kreist, 468.
- Photographs, aerial—
specifications for forest management, 667.
use in estimation of ground condition of vegetation, 637.
- Photoperiod—
and flowering of plants correlated with nitrogenous food, 185.
effect on laying hens, Fla. 96.
relation to boron requirement of plants, 796.
salt-resistance in cotton in relation to, 185.
- Photoperiodic response, factor in choice of plants for testing soil deficiencies, 795.
- Photoperiodism—
and sex in *Zea mays*, 649.
in jute in Bengal, 493.
- Phycomyces* in assay in thiamine in agar, 639.
- Phyllanthus abnormis*, livestock poisoning by, 101.
- Phyllocoptes gracilis*—see Blackberry leaf mite.
- Phyllophaga hubbelli* n. sp. from Alabama and Georgia, description, 354.
- Phymatotrachelum omnivorum*, as influenced by carbohydrates and root microfloras, 65.
- Physaloptera*—
umbata, redescription, 522.
of carnivores, 242.
spp., of carnivores, annotated list, 88.
- Physalospora zeae*—
as *Macrophoma zeae* stage, 65.
corn ear rot due to, 65.
- Physoderma menyanthis*, life history, 60.
- Physoderma menyanthis*, parasitism of *Menyanthes trifoliata*, 60.
- Phytomonas*—
betae-gelatae n. sp., cause of viscous rot of frozen beets and fructosan, 673.
tumefaciens, growth substances in, 59.
- Phytolacca americana*, Duvel buried seed experiment, final results, U.S.D.A. 201.
- Phytopathogenic bacteria, mutation induced by acenaphthene, 798.
- Phytophaga destructor*—see Hessian fly.
- Phytophthora*—
capsici, cause of tomato fruit rot, epiphytology and control, 345.
erythroseptica, invasion of potato tuber, 513.
infestans, epidemiology in potato fields, Minn. 212.
- Pickles, spicing by imitation clove oil, 267.
- Pickleworm, enemy of cucurbits, N.C. 536.
- Pig(s)—see also Hogs; Sows; Swine.
ascaris, cytochrome oxidase, 387.
breeding, feeding, and management, 375.
cleavage and attachment stages, 325.
fed desiccated egg white, biotin deficiency syndrome, 377.
fed wheat and barley, protein and mineral supplements, Mont. 845.
- feeding—
level, effect on daily gains, 845.
on cooked potato silage, Colo. 233.
trials, allotment for, relation to factors affecting rate of gain, 844.
- finishing on rations including barley, oats, and corn, Miss. 846.
- forage crops for, value, Miss. 233.
- gastroenteritis, transmissible, 394.
- growing, feeding irradiated ergosterol (D_2) and irradiated 7-dehydrocholesterol (D_3), 376.
- nutrition, nicotinic acid and level of protein intake, 375.
- placenta, histochemical reactions, 497.
- poisoning by ANTU, 854.
- roundworm, penetration of hexyl resorcinol, 242.
- treatment by sulfaguandine for coccidiosis, 564.
- tuberculin test, 247.
- typhus caused by *Salmonella suispestifer*, Nebr. 858.
- Pigeon(s)—
bone growth, X-ray effects, 47.
dietary anemia, 235.
housing, N.J. 578.
treatise, 711.
- Piglet anemia, incidence, effect of feeding green food to pregnant sow, 233.
- Piglets, weaning at early age, 547.
- Pigment(s)—
antibacterial, from *Fusarium javanicum*, 314.
deposition, inhibition in incisor teeth of rats deficient in vitamin E from birth, 432.
fluorescent, assay by fluorescence intensity, 12.

Pigment(s)—Continued

production by yeast, *Torulopsis pulcherrima*, effect of iron and other factors, 489.

Pine(s)—

cones, infestation by *Erechthias fulguritella*, 226.

fused needle disease, field observations, 519.

Jack, budworm control by forest management, 226.

Jack, natural reproduction in Pennsylvania, Pa. 205.

longleaf-slash type, glazing in, burning effects, 57.

Monterey—see also *Pinus radiata*.

increment and rainfall in Australia, 205.

pollen shed, 206.

stems, lean and ellipticity in Australia, 206.

piñon, association, vertebrate inhabitants in Death Valley region, 348.

ponderosa, second cutting cycle, 668.

production, water and light, 333.

red, thinning, ecological changes resulting, 668.

seed, viability after prolonged cold storage, 205.

slash, plantations, damage by fusiform rust, Miss. 219.

southern, bark beetles, informatory account, 84.

tip moth, informatory account, 84.

western, silviculture, entomology, 364.

white, blister rust distinguished from piñon rust in telial stage, U.S.D.A. 58.

Pineapple—

canned, vitamin content, 742.

chemical studies, 292.

plants, nitrogenous constituents, effects of potassium, 507.

α -Pinene, thermal isomerization, continuous, in liquid phase, 296.

Pink bollworm of cotton, control, cooperation between U.S. and Mexico, 535.

Pinus radiata boxes for butter, experiments, 556.

Pipunculidae, genera and subgenera, types, 353.

Plasmogam, opossoms infected with, 101.

Pistacia spp., Chinese gallnuts on, 57.

Pisum sativum, integument, sclereids, structural composition, 647.

Pith, new superior, for free-hand sections, 493.

Pittman-Robertson Act, contribution to game restoration and management, 681.

Pituitary gonadotropin, chick response to, 189.

Placenta, retained, effects of stilbestrol, 392.

Plague—

common brown rat as reservoir, 75.

distribution by mammals in United States, 350.

swine—see Swine plague.

Plants—see also specific kinds.

acid-soil factors injuring, determination, 58.

amide synthesis, 491.

and bacterial galls, comparisons of casual agents, 59.

and customs of South Seas, illustrated in Hawaii National Park, 315.

boron—

compounds in, solubility, 184.

requirements and interrelationships, 29.

requirements, relation to photoperiod, 796.

breeder, fifty years' work, 648.

bulbous, flower-development terminology in, 38.

carotene determination in, 154.

cells, diseased, effect of heteroauxine, 207.

chemical analyses and their use, 648.

chemical injections against insects and fungi, 527.

chlorophyll determination in, 154.

chlorosis (lime-induced), Idaho 58.

choice for testing soil deficiencies, factor of photoperiodic response, 795.

cobalt in, determination with nitrosocresol, 151.

copper in, determination by ashing procedures, 152.

copper ions, translocation, 648.

cultivated—

chromosome atlas, 648.

diseases and pests and their control, 219.

minor elements and deficiency diseases, 207.

dioecious, effects of animal sex hormones, 485.

disease(s)—

and pests in Denmark, 1942-43, 670.

and their control, papers, 820.

control, research progress reports, U.S.D.A. 142.

greenhouse control by soil disinfection, 61.

growth substances in, 59.

host-parasite check list revision, distribution of separates, U.S.D.A. 58.

host-parasite check list revision (Leguminosae), U.S.D.A. 57, 58.

introduction prevention, 58.

new records for Arkansas, Louisiana, and Oklahoma, U.S.D.A. 58.

physiological specialization in fungi of, 60.

relation to aerobiology, 508.

report, Dade County, Fla., 1945-46, 336.

research by experiment stations, progress reports (1945), U.S.D.A. 142.

research progress report, U.S.D.A. 141, 142, Ala. 143.

spread by air-borne and insect-borne inoculum, 508.

surveys, psychological aspects U.S.D.A. 58.

Plants—Continued

- endodermis and collenchyma differentiation by oxidation and adsorption reaction, 797.
- flora of Alaska and adjacent Canada, 33.
- flowering, correlation with nitrogenous food and photoperiod, 185.
- foods, fluorine content, effects, 273.
- foods in fertilizers, prewar world production and consumption, 482.
- forage—see Forage plants.
- geographical role, 181.
- growing in sand cultures for experimental work, 781.
- grown on acid soils, comparative effects of lime and gypsum, 787.
- growth—
 - conditions on eroded soils, vegetative cover in relation to, 26.
 - experiments, environmental factors and their control, 781.
 - hormone, content, and geotropic reaction in leaves, 319.
 - physiology, with special reference to concept of net assimilation rate, 318.
- growth regulators—
 - activity, assay by gravimetric method, 35.
 - effect on apple drop after frost, 51.
- effect on forest tree seedlings, 55, 56.
- in diseased plants, 59.
- in Meredith's actinomycete, 60.
- in sewage products, 182.
- new carriers, 319.
- role in court-nouse of grape, 73.
- rooting of cuttings treated with, 49.
- growth with nutrient solutions, I-III, 487.
- hilleculture—see Hilleculture.
- historical geography, 181.
- hormones, reduction of bud, blossom, and pod drop of canning string beans, 675.
- immigrants and stowaways, romantic story, book, 637.
- manganese deficiency, detection by tissue tests using tetramethyldiaminodiphenyl methane, 509.
- mitosis-respiration correlation in, 37.
- molybdenum in, microdetermination, 152.
- nitrate occurrence and assimilation, 183.
- nutrition—
 - and hydrogen ion, 183.
 - influence of coarsely vs. finely ground limestone, 183.
 - relation to disease development, III, fusarium wilt of tomato, 515.
 - study by grafting method, 36.
 - study by sand-culture techniques, 58.
- of Indiana, distribution records, 34.
- organic food materials, translocation, relation to movement of 2, 4-dichlorophenoxyacetic acid, 320.
- pathologists, recruitment and training in Great Britain, report, 669.
- physiology in the U.S.S.R. 639.
- potash in soils vs., 175.

Plants—Continued

- protection from black beetle by DDT, 531.
- quarantines, 58.
- affecting interstate shipments, State and Territorial, U.S.D.A. 201.
- research, soilless culture, large-scale, 783.
- respiration, monographic review, 37.
- rubber—
 - in tissues, stain technique, 21.
 - synthesis in, mechanism, 184.
- rubber-producing, estimation of rubber content of live roots, 184.
- samples, mineral contamination from grinding, 150.
- solutions in, streaming movements, 642.
- starch determination in, polarimetric method, 153.
- storage organs, respiration, relation of anaerobic to aerobic, 492.
- succession in grassland, quantitative study, 182.
- temperatures, internal, measurement by thermocouples, 486.
- tissue, effect of colchicine and acenaphthene with X-rays, 207.
- tissue, non-woody, holocellulosic component, separation, Mass. 302.
- tissues, prolonged culture in absence of growth factors, 488.
- top-root ratios, effect of top environment and flowering, 795.
- toxicity, 715.
- trace elements in, book, 29.
- variety comparisons, agrobiologic test for normality in, 173.
- vascular—
 - of Maryland, catalog, 180.
 - of Ohio, catalog of additions, 180.
- virus diseases and insect vectors, Hawaii 820.
- xanthophyll determination in, 154.
- Plant Disease Reporter—
 - 1946, U.S.D.A. 335, 319.
- index to Supplements 152-159, 1945, U.S.D.A. 670.
- index to Volume XXVIII, 1944, U.S.D.A. 819.
- Plant Industry, Soils, and Agricultural Engineering, Bureau of, report of Chief (1945), U.S.D.A. 141, 142.
- Plantain scab, *Sphaceloma plantaginis* n. sp. causing, 679.
- Plasma—see Blood plasma.
- Plasmodium—
 - circumflexum* in ruffed grouse in Ontario, 387.
 - elongatum* in Pekin ducks, 387.
- gallinaceum*—
 - Aedes lepidus* as vector, 87.
 - exoerythrocytic forms, growth in tissue culture, 249.
 - immunological relationships, 250.
 - in vitro opsonic tests, 250.
 - in young chicks, IV-VI, 387.
 - increased parasitemia, 249.

- Plasmodium*—Continued
gallinaceum—Continued
 nonpigmented forms, infection of chick embryos, 250.
 streptomycin effects, 107.
lophurae—
 immunological relationships, 250.
 'in vitro' opsonic tests, 250.
 increased parasitemia following X-irradiation, 249.
 infection in ducks, chemotherapy, continuous intravenous, 251.
relictum in canaries and pigeons, cryptozoites and metacryptozoites, 387.
 Plaster of paris blocks, moisture tension, relation to heat transfer and electrical resistance, 785.
 Plastics, protein, saturation water content, determination, 472.
 Plastid variegations, 646.
Platypus compositus, citrus attacked by, 77.
 Plecoptera of Indiana, list, 80.
 Pleistocene deposits, selenium occurrence in South Dakota, 789.
Pleocoma spp., preliminary key, 831.
 Plow, use for application of fertilizer, Minn. 312.
 Plum culture in Missouri, Mo. 202.
 Plum curculio control, 225.
 Plumbing, handbook, 108.
Plusia gamma larvae, transmission of tobacco mosaic virus, 341.
Plutella maculipennis—see Diamondback moth.
 Pneumoencephalitis, avian, status in U.S., 720.
 Pneumonia, ovine, contagious, caused by filterable virus, 394.
 Polkilocytosis in dairy cattle, effect of yeast and pyridoxine, 382.
 Point Reyes Dairymen's Association, reorganization, proposals, Calif. 408.
 Poison—see also *specific kinds*.
 Poisonous plants—see Livestock poisoning; Plants, poisonous; *specific animals and plants*.
 Polarimetry, maltose assay by, 16.
 Pole rot in Connecticut, Conn. [New Haven] 670.
 Poles, shade tent, preservation, Conn. [New Haven] 669.
 Pollilla, West Indian dry-wood termite, 837.
 Pollen—
 distance dispersion rates, 208.
 germination, mutual stimulation, 37.
 ragweed, elimination by 2,4-D with care around corn plants, [N.Y.] State and Cornell 814.
 shed, Monterey pine, 206.
 substitute, supplying to bees by dryfeeder, Ohio, 870.
 tube—
 course, in cultivated barley, 805.
 establishment in diploid and tetraploid maize, comparative rates, 798.
 Pollination of tree fruits and nuts, Wash. 202.
 Pollinators, insect, of alfalfa in California, 535.
 Polymeric fat acids, polyamides, 463.
 Polyphosphates, aid in home jelly making, 883.
 Polyploidy in plants, review of colchicine research on, 185.
 Polypores, resupinate, from Great Lakes region, Mich. 209.
 Polysaccharides—
 bacterial, effect on soil aggregation, 171.
 pyranose rings, configuration, 293.
 Polysulphides, polymeric organic, fungicides and spray adjuvants, 510.
 synthesis from sucrose by *Streptococcus* s. b. e. strains, 790.
 Polytechnic Institute Arboretum, ecological survey, U.S.D.A. 206.
 Pond, farm, management in Michigan, preliminary report, Mich. 683.
 Popcorn, hybrid, in Indiana, Ind. 659.
Popillia japonica—see Japanese beetle.
 Population—
 farm, prospects of Minnesota, Minn. 586.
 growth and food demand, U.S.D.A. 119.
 reproduction in Louisiana, La. 874.
 white, of Louisiana, educational status, rural-urban differences, 875.
 Poria, new species, descriptions, 347.
 Pork—
 canning methods, effect on riboflavin content, Ky. 894.
 cause of pregnancy disorder in rats, Iowa 887.
 cooking methods, effect on riboflavin content, Ky. 894.
 cooking retention of thiamine, riboflavin, and niacin, 428.
 production, relation to feed consumption, U.S.D.A. 725.
 trichinæ killed by 120 degrees F., 395.
 vitamin content in relation to thiamine in rations fed, 93.
 vitamin potency, influence of rations, Mo. 422.
 Posts, fence—see Fence posts.
 Potash—
 in fertilizers, determination, factors influencing, 151.
 in plants vs. soils, 175.
 requirements of cotton rotated with peanuts, 807.
 Potassium—
 chemical relationship to magnesium in organic and sandy soils of Florida, 787.
 colorimetric determination, 300.
 content of—
 leaf tissue, determination by micro-methods, 301.
 silicates, determination, 299.
 deficiency in dog, 395.
 dichromate, color of aqueous solutions, spectrophotometric study, 150.

Potassium—Continued

- effects on nitrogenous constituents of *Ananas comosus*, 507.
- iodide supplementation, effect on excretion of iodine by normal human subjects, 741.
- plant-nutrient value of sodium vs., 28.
- sallylate, effect on tobacco mosaic virus, 213.
- soil needs in New Jersey, N.J. 174.
- specificity for growth of *Aspergillus niger* 644.

Potassium-low rations for rats, response to boron supplements, 273.**Potato(es)—see also Sweetpotato(es).**

- aphid control by DDT in—
 - New York, 690.
 - northeastern Maine, 690.
- ascorbic acid content—
 - factors affecting, Nebr. 897.
 - influence of variety, environment, maturity, and storage, 897.
- bacterial soft rot—
 - of early, solar heat relations, 24.
 - temperature effects, 24.
- blight, control by copper fungicides, 672.
- blooming, spray-material effects, 66.
- bolters, explanation based on photoperiodism, 839.
- breeding for disease resistance, 66.
- breeding method, Minn. 186.
- commercial strains, susceptibility to stem-end browning, 690.
- cooked, ensilage, effect of temperature and length of storage, 840.
- cutting knife for saving labor, reducing spread of ring-rot, and reducing equipment costs, Colo. 862.
- dehydrated—
 - for fattening steers, Colo. 704.
 - peroxidase test for blanching adequacy, 122.
- demonstration plots, spray and dust treatments, 1945, N.Dak. 211.
- early blight fungus, spray and dust materials for, evaluation, N.Dak. 211.
- fertilizers, 660.
- fields, Swedish, insect fauna, and role as vectors of virus diseases, 211.
- first European, origin and reaction to length of day, 503.
- general treatise, 47.
- golden nematode on Long Island, N.Y. State and Cornell 825.
- life history, 69.
- green dwarf, virus disease, 824.
- growing and marketing, income and expenses, Cumberland Plateau, 1943-44, 869.
- insect pests, spray and dust materials, evaluation, N.Dak. 211.
- judges' scoring of boiled, discriminant functions in comparing, 121.
- late blight—
 - 1946, U.S.D.A. 824.
 - bordeaux trials against, 68.

Potato(es)—Continued**late blight—Continued**

- copper fungicides in field trials against, 68.
- epidemiology, study aids, Minn. 212.
- losses due to disease in North Carolina, 1943-45, N.C. 513.
- Maine-grown, vitamin C content, effects of storage, 661.
- marketing, wholesale, in Knoxville, Tenn., Tenn. 729.
- nitrogen content, nature and distribution, 645.
- pink rot, host-parasite relations, 513.
- price changes, causes, Pa. 729.
- production, costs, materials, and practices on Cumberland Plateau, Tenn. 112.
- production on muck soils, Ind. 198.
- retailing and consumption in Knoxville, Tenn., Tenn. 720.
- ring rot, in California, laboratory and field data, 513.
- ring-rot-like symptoms by soft-rot bacteria in, 68.
- root crop diseases, 334.
- rot nematode, *Ditylenchus destructor*, 1945, in Prince Edward Island, 212.
- sacked, mechanical field loading, N.Dak. 722.
- scab—
 - control by chlornitrobenzene, 676.
 - control by seed and soil treatment, 514.
 - presence, residual effect of crop rotations, Mich. 661.
- seed—
 - certified, value, N.Dak. 328.
 - fusarium dry rot as influenced by bruising and disinfecting, 67.
 - pieces, sclerotium rot, 68.
- seedling varieties, resistance to natural spread of leaf roll, 825.
- soft rot in 1945 crops, 672.
- solanine content, estimation and physiological role, U.S.D.A. 645.
- spraying and dusting tests (1945), 67.
- starch, physical properties due to different culinary quality, 412.
- stored, *Fusarium* spp. in wastage of, 67.
- tubers, internal necrosis, type caused by psyllids, 513.
- tubers, pathogenicity of *Bacillus polymyxa* in Alberta, 839.
- tuberworm—
 - bacterial infection of larvae, 77.
 - pupae, separation of *Macrocentrus ancyliovorus* cocoons from, factors, 535.
- varieties—
 - American, descriptions and key, U.S.D.A. 503.
 - grown in North Dakota, 1945, N.Dak. 328.
- virus diseases, determination by serological methods, 211.
- virus reactions of varieties compared, 66.
- virus Y, susceptibility, varietal differences, 672.

- Potato(es)—Continued
 vitamin C content, influence of storage conditions in Maine, 897.
 vitamin C content, plant and tubers, and factors influencing, 136.
 wart disease, immunity trials of new varieties, 68.
 yields—
 and tissue composition, effect of soil characteristics and fertilization, 810.
 residual effect of crop rotations, 661.
 spacing and seed-size relations, Maine 198.
Potentilla norvegica, Duvel buried seed experiment, final results, U.S.D.A. 201.
 Potentiometer, usefulness for plant breeders, 640.
 Poultry—*see also specific kinds*.
 breeding diets, supplements for distillers' byproducts in, 94.
 disease(s)—
 common to farm flocks, 248.
 diagnosis and control, chart, 107.
 prevention and control, 396.
 research progress reports, U.S.D.A. 99.
 dressed, evisceration, quality from defrosted, dressed stock, 411.
 farms, organization and management in Massachusetts, Mass. 404.
 fattening potency of estrogen feeding, rapid assay method, 46.
 feeding, practical, Ill. 846.
 feeding vitamins, Nebr. 846.
 feeds and rations, composition and productive energy, Tex. 706.
 feeds, riboflavin, photolysis, 707.
 growth in progeny, rate to ten weeks, relation to shank length of parents, 498.
 houses, electric ventilation, 258.
 inbred hybrid, experiments, 653.
 lighting for egg production, Wash. 705.
 marketing practices, West Virginia, W.Va. 263.
 production, treatise, 234.
 products, *Salmonella* in, 898.
 rations—
 B complex vitamins in rumen, Colo. 285.
 high wheat, riboflavin and manganese supplements, 708.
 soybean oil meal, W.Va. 235.
 research progress reports, U.S.D.A. 90, 140, 141, Ala. 143.
 Rhode Island Red, annual molt, Mass. 380.
 salmonellosis in Great Britain, 721.
 Single-Comb White Leghorn, irises—
 depigmented, histopathological study, 826.
 pigment-free, blood vessels and "ground color," 548.
 Wyandotte, fertility and hatchability, influence of heredity and environment, 498.
 farm—
 horse, factors affecting, Mich. 378.
 history and forecast, 254.
 Prairie climate, trees, 167.
 Precipitation—
 effectiveness, new formula, 310.
 in northern Rocky Mountains and North Pacific States region, foreshadowing, 310.
 in Tennessee River Basin, annual 1945, 630.
 local 8-hour forecasting, single-radiosonde analysis, 474.
 seasonal range, 310.
 winter, foreshadowing in Florida and Montana, 23.
 Precipitin production in chickens, II, in vitro, rise of interfacial titers and precipitin formation, 566.
 Precipitin reactions, flocculation rate, theory, 100.
 Pregnancy disorder induced by pork, modifications in blood, urine, and tissues of rats, Iowa 887.
 Pregnant-mare serum, chick response to, 189.
 Pressure cookers—
 food spoilage and defective gauges, 125.
 gauge testers, making and using, 139.
 Prices—*see also specific commodity*.
 agricultural—
 and national income, 724.
 index numbers (1945), Ohio 110.
 plans, quantitative comparison, 724.
 postwar, U.S.D.A. 110.
 control, farmers' stake in, W.Va. 118.
 control, international, through buffer stocks, 724.
 farm, policy, views, 724.
 farm land—*see* Land(s).
 paid by farmers during two wars, U.S.D.A. 409.
 parity policies and national employment, aspects, 724.
 policy for promotion of income from farming, 581.
 Prickly pear, biological control, 225.
 Prickly pear, fusarium disease, 829.
 Produce, prepackaged, preference of housewives, Ohio 872.
 Producer gas combustion, thermodynamics of, 162.
 Propionates, inhibition of mold growth, active agent responsible, 612.
 Protamine zinc insulin, antibacterial activity, 313.
 Protein(s)—
 added to protein-free diets compounded with amino acids, growth-stimulating action, 591.
 amino acid composition, assay, 128.
 animal, amino acids in, microbiological determination, 618.
 blood plasma, changes produced by heat in presence of sugars, electrophoretic analysis, 765.
 bristles from, 163.
 concentrates, pepsin digestible fraction, sulfur content, 610.
 cottonseed, color improvement, 764.
 denaturation, studies, 292.

Protein(s)—Continued

- diet, low, amino acid administration followed by hemoglobin formation, 593.
 dietary, effect on liver fat, 737.
 dietary level, effect on vitamin A utilization by rats, 183.
 from muscle meat of cow, buffalo, and goat, biological value, 275.
 growth-promoting powers, correlations with streptogenin content, 449.
 hydrates, peanut—
 preparation and properties, 163.
 use as tacky and remoltening adhesives, 164.
 hydrolysates—
 histidine in, determination, 618.
 lysine in, microbiological assay, 15.
 ingested, sensitizing influence, nonspecific reactions, relationship in pullorum disease, 568.
 leucine content, 1.
 methionine determination, 773.
 peanut, color improvement, 764.
 peanut, electrophoretic investigation, I, II, 763.
 plastics, saturation water content, determination, 472.
 requirements of adult human beings in content of individual foods and food combinations, 592.
 supplement in chick rations, shark meal, 707.
 yeast, nutritional value to rat and chick, 591.
- Protein-aurin complexes of wheat grain, 485.
- Protein-formaldehyde reaction, methylene bridges and unreactivity of benzoyl-*d*(—) -alanine, 764.
- Protoanemonin, antibiotic from *Anemone pulsatilla*, 180.
- Protoplasm—
 Elodea, structural viscosity, effects of various agents, 323.
 spiral form and movement in, mechanism, 37.
 torsion in myxomycete, 37.
- Protozoa, growth in tissue culture, I, *Plasmodium gallinaceum*, excerythrocytic forms, 249.
- Protozoa, tick-transmitted, in peripheral blood of clinically healthy cattle in Palestine, 392.
- Protozoology, book on, 77.
- Provitamin A activity and stereochemical configuration, IV, neo- α -carotene B and neo- β -carotene B, 615.
- Provitamins, colorimetric reaction, 18.
- Prunes—
 French, irrigation effects on growth-yield-drying ratios, 52.
 Italian, ripening in relation to maturity and storage, 58.
 microbiology during handling and drying, 417.

Pruning—

- forest trees by finger-budding method, 668.
 trees by annual removal of lateral buds, 668.
 wounds in apple trees, treatment and healing, [N.Y.] Cornell 331.
- Pseudococcus comstocki*—See Comstock mealybug.
- Pseudomonas pyocyanea*, metabolites obtained in culture, preparation methods and properties, 242.
- Pseudopyridoxine—
 activity, basis of, 158.
 excretion in urine and sweat of normal individuals, 276.
- Pyllids, cause of internal necrosis of potato tubers, 513.
- Pteridophytes, of Maryland, catalog, 180.
- Pteris aquilina*—See Bracken.
- Public health nutrition appraisal, 127.
- Publications of agricultural experiment stations, statistics (1945), U.S.D.A. 143.
- Puccinia*—
 graminis, biometrical study of spores on various hosts, 63.
 graminis tritici, physiologic races—
 Canada, 1919-44, 342.
 France, 512.
 spp., reactions of interspecific oats cross to, 41.
- Puerto Rico—
 coffee soil, saving, U.S.D.A. 666.
 fleas, 229.
 literature, bibliography, 1493-1930, P.R.U. 757.
 sweet corn, successful variety, U.S.D.A. 505.
 tobacco farms, credit, 1939-40, P. R. U. 727.
- Puerto Rico Station, report—
 1944, P.R. Fed. 441.
 1945, P.R. Fed. 605.
- Pullets—
 high protein diet, relation to nonspecific agglutinins for *Salmonella pullorum*, 568.
 production and mortality of White Leghorn, Rhode Island Red, and Barred Plymouth Rock, N.J. 378.
 sexual maturity and early egg weight, effect of selection for shank length, 498.
 summer shelter on range, U.S.D.A. 257.
- Pullorum disease—see also *Salmonella pullorum*.
 bacterial syndrome in epidemic, 106.
 control, 106.
 diet effects on epidemic, 106.
 of pouls, sulfamerazine as prophylactic, 398.
 rapid whole-blood test, use, U.S.D.A. 860.
 studies, VIII, sensitizing influence of ingested proteins, 568.
 treatment by rapid antigens, 721.
 treatment by sulfamerazine, 568.
 whole-blood test for, antigen preparation for, 106.

- Pulpy kidney disease**—*see* Enterotoxemia.
- Pump**—
 installation, salt-marsh drainage by, 86.
 magnetic glass-surfaced, for circulating liquids in high-vacuum system, 298.
 mobile-dredge, for mosquito control, 86.
- Purdue University**, notes, 288.
- Pycnometer**, for volatile mixtures and low-temperature determinations, 147.
- Pyelonephritis**, bovine infectious, diphtheroids associated, 103.
- Pyometra** following retained fetal membranes, effects of stilbestrol, 392.
- Pyracin**, agency in production of folic acid, 616.
- Pyrusta nubilalis***—*see* European corn borer.
- Pyrethrum**—
 aerosols, efficacy against common malaria mosquito and housefly, 541.
 control of adult mosquitoes, outdoors, applied with ground equipment, 368.
 extract, evaluation, chemical and biological methods, 222.
 spraying for malaria control in India, 698.
 toxicity to houseflies, comparison with DDT compounds, 229.
- Pyridoxal**—
 assay system for, 170.
 content in natural products, 158.
 phosphate—*see also* Codecarboxylase.
 phosphate in transamination, 768.
 stability, 158.
 vitamin activity for micro-organisms, 157.
- Pyridoxamine**—
 content in natural products, 158.
 stability, 158.
 vitamin activity for micro-organisms, 157.
- 4-Pyridoxic acid**, in urine—
 and sweat of normal individuals, 276.
 isolation, structure, and synthesis, 148.
- Pyridoxine**—
 chick requirement, high, 94.
 deficiency—
 effects of casein vs. tryptophan on health and xanthurenic acid excretion in mice with, 128.
 in dogs, fate of tryptophan in, 601.
 in rats, blood regeneration, 284.
 of pantothenic acid vs. effect on nervous tissues of swine, 104.
 derivatives, function, 179.
 excretion in urine and sweat of normal individuals, 276.
 function, conversion of members of vitamin B₆ group into codecarboxylase, 769.
 function in lactic acid bacteria, 179.
 4-pyridoxic acid from oxidative metabolism of, 148.
 stability, 158.
 therapeutic effect on polikilocytosis in dairy cattle, 382.
- Quail**—
 bobwhite—
 food, winter, in Virginia, 524.
 grit, mechanical value, 525.
- Quail**—Continued
 bobwhite—Continued
 mobility in southwestern Texas, 524.
 reproduction in southwestern Texas, 524.
 history and general study in Wisconsin, 76.
 in Wisconsin, 682.
 infection by *Salmonella bareilly*, 861.
 parasite studies in Mississippi, 388.
 valley, management in California, Calif. 76.
- Quaila* sp.**, galleries of wood boring insect, white deposit, composition and origin, 544.
- Quarantine(s)**—
 emergencies, present-day address, 670.
 insect, progress in, U.S.D.A. 141.
 plant—*see* Plant(s) quarantines.
- Quick decline**—
 orange trees, 217.
 studies, progress report, 346.
 rootstock, factor, 346.
 studies, 346, 347.
- Quince**, catalase of leaves, variations in lime chlorosis, 73.
- Quinidine**, metabolism in birds and mammals, 241.
- Quinine**—
 degradation in duck, chicken, and dog, 242.
 metabolism in birds and mammals, 241.
- Rabbit(s)**—
 cottontail—
 bone growth as age criterion, 521.
 winter food habits, 350.
 laboratory, scab mite control by DDT, 369.
 tick, as ectoparasite of man, 88.
- Rabies**—
 control, 396.
 diagnosis, rapid method, 396.
 immunity, antibody content of serum in relation to, 105.
 outbreak in dairy herd, 715.
- Raccoon**, new host for *Microphallus* sp., 682.
- Radiation** and living cells, 648.
- Radiations**, biological action, 606.
- Radio**—
 handbook for extension workers, U.S.D.A. 121.
 service, attitude-survey of farm and small-town-people, U.S.D.A. 120.
- Radioactive**—
 elements, effect on root-nodule bacteria, 638.
 elements, root absorption, 36.
 isotope, iron absorption in anemia determined by, 130.
- Ragweed**—
 effects of 2,4-D, Mich. 664.
 pollen, elimination by 2,4-D with care around crop plants, [N.Y.] Cornell 814.
- Rain**, evolution, 630.
- Raindrops**, size, measurement, 309.
- Rainfall**—
 annual, geographic variation on Oahu, 310.

Rainfall—Continued

- artificial, production devices for tests of water-repellent and waterproof materials, 750.
- distribution in hurricane analyzed, 23.
- Hale double solar-cycle variation in western Canada, 628.
- Ramie, fiber yield, effect of plant spacing and harvesting time, 811.
- Ramie, types, comparative evaluation under Cuban conditions, 811.
- Rams, fertility, lowered, environmental temperature and thyroid gland involvement, Mo. 800.
- Ramulispora sorghi*, sooty stripe of *Sorghum* spp. due to, 69.
- Range—
 - grasses—see Grass(es), range.
 - grassland, succession in conservatively grazed, 191.
 - land of America and management research, Utah 373.
 - mountain, soil erosion, effects of pocket gopher, 349.
 - seeding with rye nurse crops, 327.
- Rape seed, goitrogenic effects in chicks, 46.
- Raspberries, yellow rust, physiologic races in western Washington, 346.
- Rat(s)—
 - albino—
 - complete life cycle, influence of calcium intake level, 739.
 - food consumption, seasonal changes and growth rate, 275.
 - growth rate and seasonal changes in food consumption, 275.
 - bacterial infections, relation between diet and defense mechanisms, 559.
 - common brown, as plague reservoir, 75.
 - feeding succinylsulfathiazole, 276.
 - flea of Puerto Rico, 229.
 - food digestibility, measurement of digestibility of human foods and animal feeds, 275.
 - growth and lipotropism, I, dietary requirements of methionine, cystine, and choline, 738.
 - livers, storage of vitamin A, measure of relative values of carotenes in foods, 278.
 - mammary gland, as influenced by thioracil, 46.
 - Norway, common, poisoning by ANTU, instructions, 350.
 - Norway, study techniques, 220.
 - nutritional value of yeast protein, 591.
 - pyridoxine-deficient, blood regeneration, 284.
 - response to boron supplements on rations low in potassium, 273.
 - ship infestations increasing, 75.
 - wild Norway, assays of rodenticides, comparative, 350.
- Rations low in potassium, boron supplements, response of rats, 273.
- Rattus norvegicus*—
 - plague reservoir, 75.
 - study techniques, 220.
- Rayon, dyed cellulose acetate, atmospheric fumes, fastness evaluation, 605.
- Rayon fabrics used for glass curtains, Ohio, 750.
- Reaction vessel for maintenance of constant pH by continuous electrometric titration, 769.
- Real estate, farm—
 - activity in Oklahoma (1941-44), Okla. 117.
 - inheritance, U.S.D.A. 407.
 - situation trends, Ohio 110.
- Red color test for rotenone, applications, 14.
- Red spider mite, control on roses, N.Y. State and Cornell 356.
- Redwings, grain taken in cornfields, relation to number of ears opened, U.S.D.A. 525.
- Reflectometer, low-cost, and method for comparing detergency, 605.
- Reforestation in Indiana, trees for, Ind. 205.
- "Reforestator," tree-planting machine, description, Mich. 109.
- Refrigeration—
 - household, manual No. 1, 724.
 - mechanical, application to ranch egg cooling, 258.
- Regional Pasture Research Laboratory, activities and general information, U.S.D.A. 192.
- Regional Poultry Research Laboratory, East Lansing, Mich., report, 1945-46, U.S.D.A. 859.
- Reindeer, grazing on Alaska tundra, 349.
- Repellent(s)—
 - bee, 89.
 - insect, 2-ethylhexanediol-1,3, 79.
 - mosquito, new, investigation, 228.
- Research workers, in agricultural experiment stations, statistics (1945), U.S.D.A. 143.
- Research and Farming, 1946, N.C. 606.
- Resins, softening points, ring and ball, constant-temperature determination, air-bath method, 303.
- Respiration, mitosis correlation in plants, 37.
- Rhinitis, infectious, in swine, 247.
- Rhipicephalus*—
 - appendiculatus*, survival of Nairobi sheep disease virus in, 230.
 - naevet*, 1912, vector of East Coast fever, 230.
- Rhizobium*—
 - leguminosarum*, ecology and physiology of strains compared, 84.
 - spp., antibiosis absent among, 180.
- Rhizoctonia* root canker development of alfalfa, effect of soil temperature, U.S.D.A. 822.
- Rhizopertha dominica*, oviposition, influence of temperature, humidity, and density, 226.
- Rhizophyidum* spp., Brazilian chytrids, 637.
- Rhodanese, activity measurement, 767.

Rhus spp.—

Chinese gallnuts on, 57.
tanning sheepskin skivers by, comparisons, 164.

Rhyacionia frustrana—see Nantucket pine moth.**Riboflavin**—

analogs, effect on utilization of riboflavin and flavin adenine dinucleotide by *Lactobacillus casei*, 179.

and thiamine in cereal products, combined determination, rapid method, 470.

assay, in low-potency foods and feeds, 160.

content of—

dried legume seeds, 428.

eggs, assay by fluorometric method, 160.

grain and flour of Kansas-grown wheat varieties, 280.

pork, effect of cooking methods, Ky. 894.

pork, relation to thiamine fed, 93.

summer squashes, 277.

tea, 280.

tropical foods, 745.

determination, methods, comparison, Mass. 303.

effects on production of corneal vascularity and healing of corneal lesions, 600.

estimation, rapid field method, 624.

fecal, of rats receiving varying intakes of riboflavin, 430.

ice cream as source, 131.

in poultry feeds, photolysis, 707.

intake, effect on content of egg whites and yolks from individual hens, 708.

level, significance in ration of breeding hens, 548.

requirements of monkey, and new factor found in liver, 599.

retention in cooking pork and processing bacon, 428.

retention in preparation of overseas hams and bacons, 279.

supplement for high wheat poultry rations, 708.

synthesis by *Clostridium*, influence of iron inactivation by 2,2'-bipyridine, 81.

synthesis by *Neurospora*, genetic differences in strains, 35.

utilization by *Lactobacillus casei*, as influenced by riboflavin analogs, 179.

Rice—

bran extract, antioxygenic synergism in preservation of carotene, 743.

fields, airplane spraying with DDT against mosquito larvae, 87.

polish, microbiological biotin assays, growth stimulants, 429.

production, economic factors in, Tex. 112.

vitamin content, effect of milling, processing, washing, cooking, and storage, Ark. 893.

weevil small strain, oviposition, influences, 226.

white, nutritional improvement, 893.

Rickets experimental, in hamster, 748.

Rinderpest immunization of cattle, 715.

Rinderpest, St. Lawrence River project, papers I-XVI, 562.

Ring rot of potatoes in California, laboratory and field data, 513.

Rivers, and rocks, book, 143.

Roach powder, DDT formula, improvement by "Lethane A-70," 697.

Roaches, arsenite-injected, concentration-survival time curves, analysis, 539.

Robinia pseudoacacia, Duvel buried seed experiments, final results, U.S.D.A. 201.

Rocky Mountain spotted fever vector, American dog tick, control, preliminary tests, 701.

Rocky Mountain National Park, Colo., big-horn sheep, ecology, 219.

Rodent(s)—

activity in mixed prairie near Hays, Kans., 220.

bird lice of, descriptions, 88.

control, 352.

distribution of plague in United States, 350.

grey lung virus, 683.

Rodenticide(s)—see also ANTU.

Rodenticides, assays on wild Norway rats, comparative, 350.

Root(s)—

formation, in cuttings, leaf role in, 35.

inorganic ions, absorption, transport, and exudation, 489.

moisture-stress in container of saline soil, evaluation techniques, 171.

nodule bacteria—

assimilation of molecular nitrogen of atmosphere, effect of radioactive elements, 638.

development, effect of radioactive elements, 638.

in Zygothylaceae, 639.

isolation from clover species, host specificity, 316.

radioactive rubidium and phosphorus absorption in barley, 36.

rots of grains and grasses in northern Great Plains and Western States, U.S.D.A. 821.

tip smears, preparation, use of enzymes, 793.

Root-knot nematode, *Heterodera marioni*, host-parasite relationships, II, effects of host on parasite, 348.

Rooting, of cuttings treated with growth substances, 49.

Rose(s)—

garden, growing, Iowa 205.

hips, vitamin C and carotene content, 424.

multiflora, use as farm hedge, 817.

red spider mite control by azobenzene, N.Y. State and Cornell 356.

unions, bud and graft, failure due to *Otholopis thielavioides*, 218.

Rotation, crop, residual effect on potato yield and presence of scab, Mich. 661.

- Rotenone**—
 color tests for, nonspecificity, 156.
 content of *Derris elliptica*, effects of altitude and water supply, 794.
 dusts, toxicity, effect of mineral composition and particle size in dispersants, 800.
 from yam bean resin, 9.
 modified red-color test for related compounds and, applications, 14.
- Rotenone-bearing devil's-shoestrings**, response to fertilizer applications, 807.
- Rotifers**, parasites, Brazilian chytrids, 687.
- Rotproofing fabrics**—
 dimethylglyoxime-copper treatment, 900.
 soil burial test, 900.
- Roughage digestibility**, crude fiber effects in cattle vs. zebu, 91.
- Roundworms**—*see specific names*.
- Rubber**—
 content of—
 crude rubber products, determination, rapid photometric method, U.S.D.A. 777.
 guayule, effects of variations in soil moisture stresses, 807.
 guayule tissue, determination by rapid photometric method, U.S.D.A. 777.
 cooperative research in Costa Rica, U.S.D.A. 204.
 crude, products, rubber content, rapid photometric methods, U.S.D.A. 777.
 estimation of content in live roots of plants, 184.
 from *Cryptostegia* leaf latex, 162.
 hydrocarbons in plant materials, differentiation, 777.
 in plants, synthesis mechanism, 184.
 non-latex, content of *Cryptostegia*, 796.
 production from thickly seeded guayule, 808.
 staining in ground or milled plant tissues, 21.
- Rubidium**, radioactive, absorption by barley roots, 36.
- Rudbeckia hirta***, Duvel buried seed experiments, final results, U.S.D.A. 201.
- Rufinus**, herbal of, printing of Thirteenth century manuscript, 30.
- Rum**, technology of manufacture, P.R.U. 22.
- Rumen contents**, source of B complex vitamins for poultry rations, Colo. 235.
- Ruminant(s)**—
 blood constituents, changes in diseases, 560.
 physiology of digestion, 372.
 utilization of thyroxine, thyroprotein, and intermediate products, relation to route of administration, Mo. 372.
- Rumlessness**, insulin-induced, of chickens, II, III, 802.
- Rural**—
 environment, living and working values [N.Y.] Cornell 119.
 health conditions, survey, U.S.D.A. 120.
- Rural**—Continued
 institutions, Kansas, II, pioneer in rural electrification, 875.
- Life**—
 effects of war in Missouri, 1939-45, Mo. 878.
 in Iowa, 1918-1946, 874.
 postwar problems and programs in Nebraska, committee reports listed, Nebr. 111.
 promises for future, N.Y. State and Cornell 874.
 research by experiment stations, progress reports (1945), U.S.D.A. 142.
 people, radio service attitudes, survey, U.S.D.A. 120.
 public services, postwar revenues in Maryland, Md. 733.
- social**—
 organizations in U.S., Latin America, and Germany, textbook, 409.
 trends in New York, 587.
- Rural-urban migration and marriage rate**, hypothesis, 409.
- Rural Health Services Association of Wheeler County**, Tex. 875.
- Rushes**, of New Jersey swamp, 180.
- Russian dandelion**—*see* Dandelion, Russian; *Taraxacum kok-saghyz*.
- Rust fungi**, white pine blister rust distinguished from pinyon rust in white pine, U.S.D.A. 58.
- Rutgers University**, notes, 758.
- Rutin**, in *Hydrangea paniculata grandiflora* flowers, isolation, 9.
- Ryanex**, control of oriental fruit moth, comparison with DDT, 694.
- Rye**—
 ground, utilization by growing chicks, comparison with ground wheat, Nebr. 547.
 leaf, first, cultivated in isolation or attached to intact plant, growth and structure, 318.
 nurse crops in range reseeding, 327.
 varieties, performance tests (1945), N.C. 192.
 × wheat × *Elymus*, trigenic hybrids, 649.
- Ryegrass**, phialea blind-seed disease, 69.
- Sabadilla**, control of—
 green stink bug, 77.
 hairy chinch bug, 833.
- Sabethine mosquito**, new, from Jamaica, *Phonimomyia hirsuta*, 228.
- Saccharides**, simple—
 acetates, 4.
 butyrates, 4.
 propionates, 4.
- Saccharification of wood**, 21, 22.
- Saccharomyces cerevisiae***, mutant, 41.
- Saccharum robustum*** and other wild relatives of "noble" sugarcane, 323.
- Sacks**, DDT-impregnated, insect control, 85.
- Safflower seeds and oils**, 611.

- Sainfoin, verticillium wilt, cause and incidence, 673.
- St. Lawrence River Basin, stream flow measurements, 1944, 399.
- Salmonella**—
- abortus-equi*—
- etiological significance, 719.
- infection in man, 853.
- bareilly* in quail, 861.
- carriers artificially infected, 252.
- choleraesuis* var. *kunzendorf* septicemia in swine, 858.
- cultures, "induced" antigen, natural occurrence, 389.
- cultures, non-motile, flagella and flagellar antigens, 853.
- epidemic from commercially prepared sandwiches, 243.
- food poisoning transmitted by hen's egg, localized outbreak, 716.
- in poultry products, 398.
- infection—
- in man conveyed by duck's eggs, 716.
- incidence, type, and bacteriology, in Army in India, 389.
- isolation from hen's eggs, 252.
- pullorum*—see also *Pullorum* disease.
- cause of gastroenteritis outbreak, 252.
- nonspecific agglutinins, relation to high protein diet, 568.
- supestifer*, in pigs, Nebr. 858.
- three new types, descriptions, 853.
- typhimurium*—
- canine infection, with notes, 242.
- control by X-ray irradiation, 497.
- isolation from feces of turkeys, 569.
- variant, monophasic strains, observations, 716.
- Salmonellosis—
- avian, survey in Great Britain, 721.
- outbreak in horses and mules, 247.
- suis*—see *Pig typhus*.
- Sand cultures—
- growing plants for experimental work, 781.
- in plant-nutrition studies, 58.
- Sanderson, Dwight, memorial, 873.
- Sandy clay lands, eroded, reclamation in Texas, Arkansas, and Louisiana, 1931-40, U.S.D.A. 631.
- Sanitation—
- farm, guide, U.S.D.A. 724.
- in commercial canning, new interpretation, 884.
- milk, papers, 713.
- of institutional equipment, 126.
- Sap flow, in sugar maple, mechanism, 36.
- Sapotaceae, studies, V, South American species of *Chrysophyllum*, 638.
- Saprolegniaceae family members, physiological studies, V, growth substances, 484.
- Sarcocystis*, biological status, 387.
- Sarcocystis*, transmission to swine, 718.
- Sarcoma**—
- foal, transmissibility, influence of genetic factors, 326.
- Sarcoma—Continued
- Rous, causative agent, effect on bone tumors in fowls, 396.
- Sauerkraut, ascorbic acid content and quality, effect of processing and storage, 897.
- Sauger crop, utilization in Norris Reservoir, Tenn., 527.
- Sawmill scale index board, description and use, Mich. 400.
- Say stinkbug feeding on wheat, effect, 360.
- Scelio chortolcetes*, parasite of eggs of *Austroletes cruciata*, diapause, 533.
- School(s)—
- high, graduates of Washington, in depression and in war years, Wash. 586.
- lunches, references, list, U.S.D.A. 591.
- rural, problem of—
- non-attendance, N.C. 732.
- retardation, N.C. 586.
- Scleridae, North American genera, key, 686.
- Science, recent advances in biochemistry, plant physiology, and entomology, 757.
- Sclerotinia**—
- cypericolous and junicolous species, 33.
- laza* conidia, aerial dissemination, U.S.D.A. 517.
- polyblastis* on *Narcissus tazetta* var. *Soleil* d'Or, 680.
- rot in Connecticut, Conn. [New Haven] 670.
- Sclerotium rolfsii*, potato seed-piece rot by, 68.
- Scours, infectious calf, control, 103.
- Scrapie disease of sheep, 245.
- Screwworm, population studies in Arizona, 369.
- Sedges, of New Jersey swamp, 180.
- Seed(s)—see also *specific kind*.
- buried, Duvel experiment, final results, U.S.D.A. 201.
- commercial agricultural, 1945, Maine 201.
- development in *Acalypha rhomboidea* and some other Euphorbiaceae, 797.
- distance dispersion rates, 208.
- germination, microcalorimetric study, 640.
- inspection, field crops, vegetables, flowers, Mass. 504.
- leguminous, dried, riboflavin, niacin, and thiamine content, 428.
- pericarp relation to fruit growth and ripening, 38.
- separator, Iowa air-blast, trials with small-seeded grasses, Iowa 200.
- sprouting—see also *Sprouts*.
- vitamin C production, 281.
- stocks, foundation, production and distribution, Utah 664.
- treating with 2,4-dichlorophenoxyacetic acid, effect on germination and development of seedlings, 320.
- treatment, cheap insurance for low germination, 338.
- variation as shown by symbiosis, [N.Y.] Cornell 793.

- Seedlings, germinating, amino-acid changes, 491.
- Selenium—
occurrence in Pleistocene deposits and their derivatives in South Dakota, 789.
poisoning—experimental, elimination and distribution of selenium in tissues, 559.
pathology, Wyo. 559.
- Semen, bull, preservation by synthetic pabulum, 800.
- Septicemia caused by *Salmonella choleraesuis* var. *kunzendorf* in swine, 858.
- Septorella sorghi*, transfer to *Ramulispora*, 69.
- Sequoia sempervirens*, vascularization of shoot apex, cytology, 38.
- Serology, value of virus investigations, 208.
- Sesamine—
histological effects on brain and muscles of housefly, 540.
in sesame oil, determination, 155.
- Sewage—
disposal on farm, U.S.D.A. 724.
products, growth substances in, 182.
treatment, operation efficiency and factors influencing Elizabeth Joint Meeting plant, 108.
- Sewer, operation efficiency and factors influencing Elizabeth Joint Meeting plant, 108.
- Sewers, hydraulic design to facilitate flow, 108.
- Sewing fabric furnishing for the home, 435.
- Sex—
and photoperiodism in *Zea mays*, 649.
hormones—see Hormones.
identification in baby chicks of "red" varieties, 45.
- Shaft louse, control by DDT, 88.
- Shark meal as protein supplement in chick rations, 707.
- Shark meal, value in swine rations, 377.
- Sheep—see also Ruminants.
abortion following phenothiazine, 246.
artificial insemination, book, 187.
bighorn, Rocky Mountain National Park, Colo., ecology, 219.
body temperature and respiration rate, relation to adaptability, 374.
breeding for mutton and wool, U.S.D.A. 41.
breeding, productivity, factors affecting, Minn. 800.
cobalt-deficiency disease, in Australia, 169.
common liver fluke removal by hexachlorethane-bentonite suspension, 856.
cost of production in southwestern Utah, 1945, Utah 726.
deficiency diseases, therapeutic effect of small doses of cobalt in Norway, 563.
digestive capacity, determinations, variation, 843.
diseases, research progress reports, Mich. 99.
factors influencing traits, U.S.D.A. 41.
feeding tests, progress reports, 373.
- Sheep—Continued
filarial dermatosis, treatment with antimony compounds, 856.
gastrointestinal helminthiasis, control by ten per cent cunic, 564.
grazing, eradication of bindweed, Minn. 505.
hookworm, heavy infections, probable origin, 717.
husbandry in Great Britain, 374.
hydrocarbons administered to, techniques, 104.
John's disease, serological diagnosis, 393.
louping-ill, virus studies, 393.
multinipple trait—
genetics, physiology, and economics of, U.S.D.A. 188.
incidence and genetic cause, 42.
nematode parasites, survival on summer pasture, 245.
palatability of hay and pasture grasses, Oreg. 843.
parasites—
efficacy of phenothiazine, 246.
studies, VI, relation of weather to untreated nematode infections, 388.
phenothiazine administered to, techniques, 104.
"pinning" prevention by cobalt in Cornwall and Devon, 704.
prenatal development, Minn. 188.
range, breeding projects in Canada, 497.
rat infestations increasing in, 75.
research progress reports, U.S.D.A. 90.
scrapie disease, 245.
selenium poisoning, experimental, elimination and distribution of selenium in tissues, 559.
skin folds, inheritance, 325.
starting right, 374.
strongyles, gastrointestinal, action of phenothiazine, 394.
tapeworm, lead arsenate treatment, Miss. 717.
tapeworm, *Moniezia expansa*, removal by lead arsenate, preliminary report, 564.
tick—
cuticle, penetrability by insecticides, 222.
distribution on hill pasture, 229.
Ixodes ricinus, control by DDT, 701.
water balance, 229.
vitamin D requirement, 233.
- Sheepskin skivers, tanning, sumac species compared for, 164.
- Shelter, summer, for pullets on range, U.S.D.A. 257.
- Sherbets, sugar conservation in, 99.
- Shigella equiruli*, animal infection, 100.
- Shrew, short-tailed, *Longistriata caudabulata* n. sp. from, description, 683.
- Silage—
alfalfa, for fattening steers, Colo. 704.
barley-timothy, comparison with molasses-timothy silage for milking cow, N.J. 236.

Silage—Continued

- corn and alfalfa, relation to cheese quality and carotene and vitamin A content, 241.
- grass, chemistry, U.S.D.A. 545.
- ground barley-grass, comparison with molasses-grass silage for milking cow, N.J. 236.
- meadow crop, loss of nutrients during storage, 370.
- molasses-grass, comparison with ground barley-grass silage for milking cow, N.J. 236.
- molasses-timothy, comparison with ground barley-timothy silage for milking cow, N.J. 236.
- potato—
 - cooked, results in pig-feeding experiment, Colo. 233.
 - effect of temperature and length of storage, 840.
 - making and feed value for dairy cows, U.S.D.A. 381.
- production and utilization in Mississippi, 371.

Silicates—

- crystalline, base exchange in, 145.
- potassium content, determination, 299.
- sodium content, determination, 299.
- Silt loam, Hagerstown, aggregation, seasonal variability, 784.

Simulium spp., larvicidal control by DDT, 88.

Sinusitis, infectious, treatment in turkeys, 398.

Siphons, priming value for portable, 107.

Siphophyto, review with key to species and new taxonomy, 687.

Sires, Holstein, 1,260, production influence, [N.Y.] Cornell 711.

Sires, improved, use in station herds, Ohio 799.

Sirup—

- apple, by ion exchange process, 161.
- invert, preparation, new methods, 765.
- maple—see also Maple.
 - dark color, factors causing, N.Y. State 307.
 - storage, N.Y. State 307.

Sitanion, *Elymus*, and *Agropyron* hybrids, artificial and natural, 648.

Skunk—

- parasites, helminth, in Texas, 221.
- scent glands, ablation, 248.

Slags, calcium-silicate, neutralization value, titration, 13.

Slash disposal on Colville Indian Reservation, 254.

Slashbuncher teeth, development and use by Forest Service, 254.

Sludge, sewage (digested), fertilizer value, 29.

Smoke, ineffectiveness for frost protection to fruit crops, 816.

Smut—

- flag, of wheat in Mexico, 511.
- loose, four races, reactions of oat varieties and selections, 511.

Smut—Continued

- loose, response of spring barley varieties to floral inoculation, 871.
- of sugarcane varieties, effects during crop year 1944-45, 212.

Snares and deadfalls for capturing wildlife, 829.

Soap solutions, foaming properties, 465.

Social trends, rural, in New York, 587.

Society of American Bacteriologists, proceedings of local branches, 313.

Sociology, rural—

- current research, review, 873.
- postwar problems and programs in Nebraska, committee reports listed, Nebr. 111.
- research by experiment stations, progress reports (1945), U.S.D.A. 142.

Sodium—

- amalgam reductions, continuous electro-metric titration, reaction vessel for constant pH, 769.
- chloride, toxicity to chicks of excessive ingestion, 105.
- content of silicates, determination, 299.
- fluoacetate ("1080"), use in Murine typhus control in Southwest, 358.
- fluoride, efficacy in removal of swine ascarids, 718.

hydroxide, bactericidal activity, influence of changes in concentration, 791.

pectate, X-ray diffraction investigation, 294.

sulfamerazine, use in treatment of cecal coccidiosis, 251.

Soft scale, infestation coincident with yellow scale, role of ants in, 77.

Soil(s)—

- acid, plant-injuring factors in, determination, 58.
- acid, plants grown on, comparative effects of lime and gypsum, 787.
- aggregation, as influenced by bacterial polysaccharides, 171.
- alkali, in Iran, 784.
- and crops of Oklahoma, report, 1946, Okla. 753.

and soil management, book, 24.

applications of coal, results in Utah, 789.

arid, moisture effects on dissolved and exchangeable ions, 171.

auger, general purpose, Colo. 722.

California Prairie, pedologic study, 783.

carbonaceous residues, utilization, nitrogen requirement, 480.

characteristics and fertilization, effect on yield and tissue composition of potatoes, 810.

chemical analysis, collecting samples for, Ga. 24.

clay mineral content, relation of parent material and environment to in Iowa, 783.

Clostridia in, occurrence, 25.

cobalt-deficient, in Australia, 169.

coffee, saving in Puerto Rico, U.S.D.A. 666.

Soil(s)—Continued

- colloidal behavior, XXIV, Donnan equilibrium in soil formation, 477.
- conservation and abuse, U.S.D.A. 311.
- conservation, book, 26.
- crystalline calcium silicate and "glassy" materials, carbonation variance, 480.
- cultures—
 - modified Mitscherlich method, 782.
 - modified Neubauer method, 782.
 - pot method, equipment and operative technique, 781.
- DDT applications, effects on black beetle, 531.
- deficiencies, testing, choice of plants for, factor of photoperiodic response, 795.
- dispersed, freezing and thawing, effect on aggregation and permeability, 169.
- drifting across eroding fields, cumulative intensity, 172.
- elements, effects on food, symposium, 272.
- eroded, plant-growth conditions in relation to vegetative cover, 26.
- erosion—*see* Erosion.
- fertility—
 - decrease in Black Belt, effect on alfalfa, Miss. 786.
 - practices in war and peace, U.S.D.A. 581.
 - standards for game food plants, 520.
- fertilizer needs determination by leaf analysis, 321.
- fertilizers balanced by tests for potassium and phosphorus in, 174.
- fluorine content, 788.
- forest, relation to growth, treatise, 630.
- formation, Donnan equilibrium, 477.
- "glassy" and crystalline calcium silicate materials, carbonation variance, 480.
- greenhouse, chemical disinfection, 61.
- gypsum as corrective and builder, Ariz. 28.
- Honeoye—
 - erodibility, 178.
 - organic matter in, erosion effects, 178.
- losses of nitrous nitrogen on desiccation, 479.
- Lufkin fine sandy loam, as influenced by plowing under hairy vetch, 196.
- management in Lower Rio Grande Valley, Tex. 476.
- microbiological activities, influence of incubation temperature, 785.
- minerals, influence on insects, 532.
- moisture—
 - deficiency, effect on leaf elongation and fruit growth of Deglet Noor date, U.S.D.A. 208.
 - measuring methods, compared, 170.
 - tensiometers, adaptation to field use, 170.
- molybdenum in, microdetermination, 152.
- nitrogen conservation in—
 - influence of time and plowing under legumes, 191.
 - legume management factors, 27.
- of Wasatch Mountains, properties, 784.

Soil(s)—Continued

- organic and sandy, chemical relationships of potassium and magnesium in central Florida, 787.
- organic residues, effects on semiarid soil, 786.
- phosphate retention, 176.
- phosphate adsorption in Illinois, 175.
- plant relations, balancing, 174.
- plant-nutrient value, 28.
- potassium needs in New Jersey, N.J. 174.
- properties influencing use of land in West Virginia, W.Va. 476.
- reaction—
 - effect of sources of nitrogen, 786.
 - effect on blueberry culture, 53.
 - relation to toxicity and persistence of herbicides in greenhouse plots, U.S.D.A. 478.
- research—
 - by experiment stations, progress reports (1945), U.S.D.A. 142.
 - progress reports, U.S.D.A. 140, 142.
 - progress reports, Ala. 143.
- saline, heat resistance of cotton leaves, 86.
- saline, moisture-stress on roots in container, evaluation techniques, 171.
- sampling tube, 25.
- saturated, electrical conductivity, means of estimating soil solution concentration, 478.
- science, bibliography, 1940–44, 781.
- series and types, arrangement according to functions of soil-forming factors, 783.
- solution concentration, estimation from electrical conductivity of saturated soils, 478.
- straw mulch for improvement of, 173.
- structure, clay-mineral role in, 169.
- sulfur as corrective and builder of, Ariz. 29.
- survey—
 - in Tennessee, Lincoln County, U.S.D.A. 25.
 - reports, 1936 series, U.S.D.A. 812.
- temperature—
 - apparatus for recording, 108.
 - crop-residue effects, 27.
 - effect on development of rhizoctonia root canker of alfalfa, U.S.D.A. 822.
 - relation to development of armillaria root rot, Calif. 209.
- tensiometer design, improvements, 477.
- testing service increasing, Miss. 170.
- thermal relationships, apparatus for recording, 108.
- thermometers, field-type, 167.
- tillage—*see* Tillage.
- treating with 2,4-dichlorophenoxyacetic acid, effect on germination and development of seedlings, 820.
- treatments—
 - chemical, effect on development of wheat mosaic, Wash. 214.
 - effect on chemical composition of hay and forage crops, 481.

- Soll(s)**—Continued
 treatments—Continued
 effect on soil productivity, summary of long-time field experiments, Ill. 632.
 water relationships, apparatus for recording, 108.
 yeast, lipid production by, 25.
 Soll-air, displacement by CO₂ for permeability tests, 785.
- Soil Conservation Service**, report of Chief (1945), U.S.D.A. 26.
- Soilless culture** for plant research, 783.
- Solanum nigrum***, Duvel buried seed experiments, final results, U.S.D.A. 201.
- Solar**—
 activity, relations with lower atmosphere, 473.
 radiation, potato soft rot effects, 24.
 variation, measuring, 166.
 variation, weather effects, 166.
- Solvents**—
 for absorption spectroscopy, purification by adsorption method, 161.
 Industrial, compositions and trade names, 140.
 rapid removal, apparatus, 298.
- Somatic chromosomes**, root-tip smear method, use of enzymes, 793.
- Sorghum**—
 amylase, composition and traces in malt, 613-614.
 Hodo, July-planted, for grazing beef cattle after frosts, unsatisfactory, Miss. 233.
 midge, distribution, 77.
 seed, subcoat, second factor, 798.
 spp., ramulispora sooty stripe disease of, 69.
- South Africa**, milk, solids content, 553.
- South America**, agriculture, notes, U.S.D.A. 606.
- South Carolina Station**, report, 1945; S.C. 909.
- Southern**—
 bean mosaic virus, purification and crystallization, 71.
 corn rootworm, general study in Nebraska, Nebr. 83.
 house mosquito, larvicidal action of DDT, factors in, 77.
 pine bark beetles, informatory account, 84.
 pine sawyer, informatory account, 84.
- Southern Great Plains Field Station**, Woodward, Okla., chlorosis of grapes, Okla. 679.
- Sows**—*see also* Hogs; Pigs; Swine.
 estrus in lactating, induction by equine gonadotropin, 46.
 feeding sardine condensed fish solubles and rye pasture during gestation and lactation, 845.
 pregnant, feeding green food, effect on incidence of piglet anemia, 233.
- Soya products**, edible, susceptibility in storage to attack by *Tribolium confusum*, Minn. 886.
- Soybean(s)**—
 bud blight, caused by tobacco ring-spot virus, 212.
 canned, chemical and nutritional studies, 882.
 choline content, 273.
 fertilizers, lime, potash, phosphate, N.C. 662.
 infection by *Xanthomonas phaseoli* var. *sojense*, severity, relation to stomatal behavior, 339.
 insects, control, N.C. 691.
 lecithin, fatty acid components, 465.
 lime spray repellents against Japanese beetle, 352.
 meal, in dry calf starters with limited quantities of milk, Nebr. 237.
 nitrogen fixed, yield and quantity, effect of straw and nitrogen, 811.
 oil—
 content, determination, 621.
 content, determination, effect of relative humidity, 469.
 fatty acid composition, relation to iodine number, 460.
 feeding to rats, resultant body-fat changes, off of dietary adjuvants on, Iowa 594.
 solvent extraction from raw materials, bibliography, 457.
 oil meal—
 autoclaving, influence on availability of cystine and methionine for chick, 847.
 feeding to hens, effects on viability of progeny, 547.
 in poultry rations, W.Va. 235.
 phosphorus, availability for rat, 596.
 phosphorus, utilization, enzymatic relationships, 596.
 preharvest sampling for quality and yield, Iowa 199.
 respiration, relation to moisture content and mold growth, 825.
 sampling for analysis, 469.
 varieties, abnormal swellings on stems, anatomy, 796.
 varieties and planting dates in Yazoo-Mississippi Delta, Miss. 503.
- Spanish-English glossary** of forestry terminology, U.S.D.A. 667.
- Sparrow**, English, blood parasites of eastern Washington, 525.
- Spectrophotometry**—
 gossypol assay by, 14.
 rotenone and related compounds determined by, 14.
- Spectroscopy**, absorption, solvents purified by adsorption method, 161.
- Spermatophytes**—
 Dominican Republic, book, 181.
 Maryland, catalog, 180.
- Spermatozoa**, bovine, livability and metabolism, effect of sulfanilamide, 496.
- Sphaceloma plantaginis*** n. sp., cause of scab of plantain, description, 679.

- Sphagnum*, cellulose content, nature, 645.
 Spicing pickles with imitation clove oil, 267.
 Spider(s)—
 of Great Swamp, preliminary list, 221.
 of Iowa, studies, 527.
 of Maryland, annotated list, Md. 527.
 poison-squirting, note, 351.
 Spinach—
 dehydration, variety role in quality, 128.
 injury from soil nitrogen and thrips, 225.
 virus inhibitors in extract, 334.
Spiraea aruncus, antibiotic isolation, 483.
 Spirochetosis in turkeys, 399.
 Spittle insects, control in strawberry plantings, 835.
 Spittlebugs of Missouri, 221.
 Spores, distance dispersion rates, 208.
 Spray(s)—
 adjuvants, polymeric organic polysulphides, 510.
 application relations to leaf areas, 78.
 DDT, dispersion from fast aircraft, 79.
 effect on blooming of potatoes, 66.
 for potato demonstration plots, 1945, N. Dak. 211.
 herbicidal, water-soluble, glycerin as supplement, 814.
 materials for potato—
 early blight fungus, evaluation, N.Dak. 211.
 insect pests, evaluation, N.Dak. 211.
 new, in control of insects and diseases, 355.
 oil, for weeding—
 carrots, N.Y. State and Cornell 330.
 carrots and related crops, Mich. 328.
 residues, DDT in, analysis, 778.
 xanthone residues in, colorimetric analysis, 156.
 Sprayers for—
 control of apple scab, 827.
 dispensing concentrated insecticides, 831.
 Sprouts—*see also* Seeds, sprouting.
 legume and cereal, substitute for fresh vegetables, 266.
 Spruce, Norway, cuttings, rooting, seasonal progress, 667.
 Squab raising, U.S.D.A. 552.
 Squash(es)—
 bugs, immature, control, 693.
 root aphids, 77.
 skin, changes during storage, and relation to spoilage, 665.
 summer, ascorbic acid, carotene, chlorophyll, riboflavin, and water content, 277.
 winter, mottled-leaf character dominant, 187.
 Squirrel, Mexican ground, life history, 683.
Stachybotris, vitamin requirements, 484.
 Stains—
 biological, handbook on nature and uses of dyes employed in biological laboratory, 778.
 Stains—Continued
 standardization, progress, 779.
 technique—
 for bacterial counts in dried milk, 11.
 for rubber in ground or milled plant tissues, 21.
 virus isoelectric point determined by, 59.
Staphylococcus (s)—
 infection, enzootic, of lambs, associated with tick-bite, II, bacteriology, 563.
 mastitic, culture characters, 98.
 Starch(es)—
 acid-hydrolyzed, production of 2,3-butanediol, 766.
 determination in corn and wheat, improvements, 472.
 determination, rapid, acid and enzymic hydrolysis methods, 301.
 fractionating technique, 15.
 fractions, iodine color, estimation, 772.
 from potatoes of different culinary quality, physical properties, 412.
 iodine color, estimation, 772.
 pea, amylose content, 450.
 rotation of dispersions, reversible effect of stannic chloride, 3.
 Starvation—
 human, and consequences, 886.
 metabolism of oats leaves under, 184.
 Statistical methods in chemistry, 1.
 Statistics, experiment-station (1945), U.S.D.A. 142.
 Stearic acid—
 adsorption analysis, technique, 155.
 preparation from castor oil, 611.
 Steers—
 beef, feeding value of corncobs and shucks, 547.
 beef, selection, fitting, and showing, Fla. 233.
 breeding for beef production, U.S.D.A. 41.
 fattening on dehydrated potatoes and alfalfa silage, Colo. 704.
 two-year-old, fattening on grass, supplements, progress report, 373.
 two-year-old, wintering on grass, protein and mineral supplements, progress report, 373.
 utilization of—
 roughage and pasture, Mich. 703.
 simple compounds of nitrogen, 231.
 yearling, wintered at different levels, summer gains, progress report, 374.
 Stem rust reaction, inheritance in barley cross, correlation with nitrogen content and kernel weight, 648.
Stemphylium, Danish species, monograph, 60.
Stenocranus spp. in America north of Mexico, taxonomy, 353.
Stenosphenus, cerambycid beetles in America north of Mexico, synopsis, 221.
 Stereochemical configuration and provitamin A activity, IV, neo- α -carotene B and neo- β -carotene B, 615.

- Sterility, female, genes in dairy cows for, 187.
- Sterol production by *Aspergillus flavus-oryzae* and anti-rachitic potency, 430.
- Stickers, for lead arsenate sprays on fruit trees, Conn. [New Haven] 531.
- Stiff-lamb disease, prevention and cure by vitamin E, 855.
- Stilbestrol—
capon production by, 190.
derivatives, feeding to chicks, effects on glands, body weight, and dressing appearance, 499.
effects in retained placenta, 392.
effects on pyometra following retained fetal membranes, 392.
- Stinkbugs, life history, 695.
- Stipagrass, green, description and value, N.Dak. 656.
- Stockings—*see* Hosiery.
- Stomatitis, vesicular, virus of swine origin, 243.
- Stoneflies of Indiana listed, 80.
- Storage, short-time, effect on ascorbic acid content of grapefruit juice, 283.
- Stored products, beetles associated, monograph, 85.
- Storm ice, damage to hardwoods, decay following in central New York, 829.
- Straw mulch for soil improvement, 173.
- Straw, strength in small grains, [N.Y.] Cornell 803.
- Strawberry (ies)—
ascorbic acid content, varietal differences, La. 899.
breeding for high vitamin C content, N.Y. State and Cornell 817.
freezing experiments in Louisiana, 881.
growing in Washington, Wash. 203.
marketing, experimental, Ohio 816.
new varieties, N.C. 665.
plantings, spittle insects, control, 835.
virus complexes, resolution by means of aphid vector, *Capitophorus fragariae*, 678.
weevil, insecticidal trials, 84.
- Strepogenin content of proteins, correlation with growth promotion, 449.
- Streptococci associated with subacute bacterial endocarditis, 791.
- Streptococcus*—
agalactiae—*see* Mastitis.
faecalis—
amino acid requirements, 179.
threonine assay by, 179.
lactis R-stimulating factor, enzyme producing from inactive precursor substance in yeast, 614.
s. b. e. strains—
association with subacute bacterial endocarditis, 790.
immunological characteristics, 790.
synthesis of polysaccharide from sucrose, 790.
spp.—*see also* Betacocci.
- Streptomyces griseus*, metabolism and chemical nature, 791.
- Streptomycin—
absorption and excretion by dogs, preliminary studies, 248.
activity, relation to bacterial spores and preservation of milk, 852.
in avian malaria therapy, 107.
properties, toxicological and pharmacological, 388.
- Striga* spp., parasitism on *Dolichos lablab*, 513.
- Strigoderma arboricola*, life history and habits, 689.
- Strongyles, sheep, gastrointestinal, action of phenothiazine on, 394.
- Strongylosis, pulmonary, in swine, 857.
- Strongylus vulgaris*, infestation of horses, 395.
- Stubborn disease of citrus, virosis, symptoms, 828.
- Sturgeon, lake, in Lake Winnebago, Wis., 76.
- Subtilin antibiotic produced by *Bacillus subtilis*, I, II, action and toxicity, 636.
- Succinylsulfathiazole, failure to aggravate egg-white induced biotin deficiency in rats, 429.
- Succinylsulfathiazole, feeding to rats receiving purified diets, 276.
- Succulometer, for measurement of maturity of raw and canned whole kernel corn, description and use, 770.
- Sucrose—
acid inversion, 610.
enzymatic synthesis of dextran, 765.
in binary mixtures, estimation, 304.
nutritive value of dextrose vs. in rats, 186.
polysaccharide synthesis by *Streptococcus* s.b.e. strains, 790.
synthesis by bacteria, mechanism and significance, 31.
utilization, as influenced by thiamine in rats, 136.
- Sucrose-invert sugar mixtures, assay by copper reduction method, 15.
- Sugar(s)—
acetyl groups in acetates of, microdetermination, 158.
assay techniques, 15.
conservation in ice cream, ices, and sherbets, 99.
crops, research progress reports, U.S.D.A. 142.
decomposition in dilute acid at high temperature, 21.
hydroxyl content, microdetermination, 153.
rare, utilization by micro-organisms, 178.
reducing groups, measurement by Killiani reaction, 620.
wood, analysis methods, 153.
wood, fermentation to alcohol, 162.
- Sugar beet(s)—
bacterial blight, seed transmission, 673.
cercospora leaf spot, epidemiology and control, Iowa 70.

Sugar beet(s)—Continued

- curl, virus, occurrence in meristematic tissue, 515.
- foliage, chlorosis and necrosis, causes, 678.
- grown for seed, damage by *Euschistus impictiventris* and *Othiorhiza sayi*, 834.
- harvester, trials in Michigan, 1945, Mich. 722.
- mosaic in New Zealand, 514.
- seed, shearing effects on labor, stand, and yield, Mich. 47.
- yellow wilt in Argentina, U.S.D.A. 826.
- yellows, serological investigation, 1942-43, 514.

Sugarcane—

- borer, control by dusting with cryolite, 860.
- disease situation in Louisiana, 514.
- disease testing and initial seedling selection at Houma Station, 1945, U.S.D.A. 674.
- froghopper, insecticidal trials, 84.
- juice, constituents, isolation by chromatographic methods, 801.
- lands, weed control by 2,4-D, U.S.D.A. 811.
- noble, wild relatives, 323.
- response to hot-water treatment, La. 515.
- stomate differentiation in, 38.
- varieties, smut, effects during crop year 1944-45, 212.

Sulfa—

- drugs, control of—
 - American fowlbrood, 544.
 - fowl typhoid infection, 568.
- treatment of American fowlbrood, 702, 840.

Sulfadiazine treatment of man for anthrax, 242.

Sulfaguanidine—

- effect on caecal coccidiosis, Del. 858.
- effect on course of infection in chickens with *Eimeria tenella*, 397.
- value, prophylactic and curative, in swine coccidiosis, 564.

Sulfamerazine—

- prophylactic in pullorum disease in poult, 398.
- treatment of—
 - experimental cecal coccidiosis of chickens, 398.
 - pullorum disease, 568.
 - respiratory diseases of turkeys, 569.
 - strangles, 100.

Sulfanilamide—

- cytological effects on *Allium cepa*, 324.
- effect on livability and metabolism of bovine spermatozoa, 496.

Sulfate, titrimetric determination in natural waters and soil extracts, 771.

Sulfathalidine in treatment of enteric infections of small animals, 248.

Sulfathiazole—

- for turkey diseases, ineffectiveness, 569.
- medication for American fowlbrood or honeybees, 702.

Sulfonamides—

- action on certain fungi pathogenic to man, 815.
- effect on growth of legume, 183.
- pharmacology, aspect, 854.
- recently developed, efficacy against fowl typhoid, 860.
- therapy, 853.
- toxicity, to chicks evaluated, 106.

Sulfur—

- content in feeds, assay methods, 20.
- dioxide, content of—
 - dehydrated foods, determination, 155.
 - fruits, determination, 306.
- feeding to lambs, results, Colo. 856.
- in feeds, determination of total, nitric and perchloric acid digestion procedure modified, 156.
- soil corrective and builder, Ariz. 29.
- toxicity to livestock in combination with protein concentrates, 854.

Sumac(s)—

- native species, tannin production, 322.
- tanning sheepskin skivers by, species compared, 164.

Sunflower—

- new cultivated from Mexico, 812.
- seed and oils, 611.
- seed protein, value, 235.
- tissue cultures, growth in vitro, influence of composition of medium, 793.

Sunlight intensities, effect on nitrate utilization by coffee plant, Hawaii 203.

Sunscald, tomato seedlings, production by "flue dust," 345.

Superphosphate, concentrated, mixing and curing effects on conversion, 176.

Surgical instruments, sterilization, 386.

Sweat—

- excretion of ascorbic acid and dehydroascorbic acid under different environmental conditions, 740.
- inositol and *p*-aminobenzoic acid occurrence, 740.
- of normal individuals, excretion of pyridoxine, "pseudopyridoxine," and 4-pyridoxic acid, 276.

Sweetpotato(es)—

- acreage and prices in Tennessee, Tenn. 112.
- ascorbic acid content—
 - and carotene content, varieties and storage losses compared, Ariz. 131.
 - effect of curing, S.C. 891.
 - effect of fertilizers, curing, storage, and cooking, Ga. and N.C. 742.
- carbohydrates, changes occurring during dehydration, blanching, or baking, S.C. 878.
- carotene content, effect of—
 - curing, S.C. 891.
 - fertilizers, curing, storage, and cooking, Ga. and N.C. 742.
- dried, feeding to fattening hogs, progress report, 373.

- Sweetpotato(es)—Continued
 gels, making and uses, 122.
 leaf beetle, host and distribution records, 860.
 production, economic factors in northern Louisiana, La. 113.
 raw and cooked, vitamin B content, 278.
 starch determination in, polarimetric method, 153.
- Swine—*see also* Hogs; Pigs; Sows.
 antibody response to vaccination with formalin-inactivated purified swine influenza virus, 718.
 artificially infected with hog cholera, concentration of virus in blood, 394.
 ascarids, removal by sodium fluoride, 718.
 breeding, results of nine years, 325.
 coccidiosis, sulfaguanidine for, prophylactic and curative value, 564.
 diseases, research progress reports, U.S.D.A. 99.
 Duroc, American breed, story, 705.
 erysipelas culture vaccines, validity, Nebr. 565.
 erysipelas in turkeys, 860.
 fattening in dry lot, waxy vs. nonwaxy corn for, 92.
 fattening on pasture, cull peas as protein supplement, Idaho 92.
 feeding tests, progress reports, 373.
 growing, effect of thioracil, 234.
 Hampshire, growth rates, effectiveness of selecting for, 43.
 infection by *Sarcocystis*, mode of transmission, 718.
 infectious rhinitis, 247.
 louse, *Haematopinus suis*, eradication by single treatment of DDT, 543.
 orchitis due to *Brucella suis*, 565.
 pantothenic acid vs. pyridoxine deficiencies in, effect on nervous tissues, 104.
 parasites and parasitic diseases, 857.
 pastures, economy in feed and increase in profits, Mich. 704.
 plague, spread by garbage and street sweepings in São Paulo, 105.
 Poland China, hybrid vigor in crosses of inbred lines, 43.
 protein supplements, synthetic nutrients added to, 93.
 rations, influence on vitamin potency of pork, Mo. 422.
 rations, value of shark meal, 377.
 research progress reports, U.S.D.A. 90.
 septicemia caused by *Salmonella choleraesuis* var. *kunzendorf*, 858.
 thiamine in ration, effect on vitamins in tissues, 93.
 weight, single vs. 3-day average, 93.
- Symbiosis—
 between orchid plants and fungi, 485.
 indication of seed variation, [N.Y.] Cornell 793.
- Synchytrium decipiens* and *S. chrysosplenii*, histopathology, 670.
- Sysimbrium altissimum*—*see* Tumblemustard.
- Tachinid genera *Siphophyto* and *Coronimyia*, review, with key to species, 687.
- Tagua, nuts, harvesting and handling, U.S.D.A. 204.
- Tail mites on mink, control by Hy-Kresol dip, 88.
- Tailoring techniques for woman's suit, U.S.D.A. 139.
- Tanganyika, locust campaign, 533.
- Tangerines, ascorbic acid content and factors influencing, Ariz. 137.
- Tannin production from native species of sumac, 322.
- Tanning, of sheepskin skivers, sumac species compared for, 164.
- Tanytarsus* in Iowa, description, 534.
- Tapeworm—*see also specific names*.
 infestation of lambs, cause of scouring, and control, 856.
- Taphrina deformans*, culture study, *Torulopsis pulcherrima* compared, 61.
- Taphrina* leaf curl of sand cherry, control, 828.
- Taploca, nutritive value, 412.
- Taraxacum kok-saghyz*—*see also* Dandelion, Russian.
 development in sand culture, effect of boron concentrations, 491.
 tetraploid, II, characters of F_1 plants grown in pots, 650.
- Tea—
 nicotinic acid content, 280.
 pantothenic acid content, 280.
 production in Brazil, U.S.D.A. 666.
 riboflavin content, 280.
- Teeth—
 of rats deficient in vitamin E from birth, pigment deposition, inhibition, 432.
 of white rats and hamsters, effects of acidic beverages, factors influencing, 739.
 school children, relation to diet, Fla. 886.
- Telang livers, nutritional value, 423.
- Temperature(s)—
 effects on—
 cellulosic materials, including tire cord, 284.
 development of immature stages of *Anastrepha serpentina*, U.S.D.A. 537.
 expression of yellows virus in sour cherries, 345.
 high, regional contrasts, 628.
 low, effect on vegetation of Barrens in central Pennsylvania, 311.
 low, susceptibility of hibernating codling moth larvae to, and bound-water content, 536.
 minimum, microclimatic differences and variations in frost injury to hill-culture plants, 475.
 of incubation of eggs, effect on character expressions in fowls, 188.
 soil—*see* Soil(s) temperature.

- "1080" ("ten-eighty")—*see* Sodium fluoacetate.
- Tenebrio molitor*—*see* Yellow mealworm.
- Tennessee Station, notes, 446.
- Tennessee University, notes, 446.
- Tensiometer design, improvements, 477.
- Tensiometers, soil-moisture, adaptation to field use, 170.
- Teosinte diseases in Mexico, 334.
- Tephrosia*—
- noctiflora*, contact insecticide and fish poison in Argentina, 359.
 - virginiana*—*see* Devil's-shoestrings.
- Terminology, of flower development in bulbous plants, 38.
- Termite(s)—
- attack, natural resistance of woods, U.S.D.A. 696.
 - cellulose decomposition by, mechanism, 31.
 - dry-wood, West Indian, 837.
 - exposure test, international, fifteenth progress report, 838.
 - resistance of treated cotton fabrics, 604.
- Terrace, bluegrass, outlet channel design, 722.
- Tetanus, equine, fatal case, penicillin therapy, 395.
- Tetramethyldiaminodiphenylmethane, use for detection of manganese deficiency in plants, 509.
- sym*-Tetraphenylethane, from DDT and related compounds, 9.
- Teznanus* spp., nonspecific transmission of California aster yellows virus, Calif. 363.
- Teznanus* spp., characters, distribution, and food plants, Calif. 363.
- Texas, Polk County, geographical survey, 755.
- Texas College, notes, 759.
- Texas Station, notes, 446, 608.
- Textile(s)—*see also* Fabrics; *specific kinds*.
- apparel, wear resistance, 434.
 - civilian, effects of war, 284.
 - colored, fading, relations to light, 138.
 - coolness, measurement, new test apparatus, 433.
 - detergency, comparison, and low-cost reflectometer, 605.
 - fibers from casein, 163.
 - flammability, committee report, 434.
 - fungicides, effectiveness, 899.
 - flammability, legislation and test method, 434.
 - materials, abrasion mechanics, 433.
 - materials, flammability, operating instructions and test procedure, 604.
 - research progress reports, U.S.D.A. 142.
 - resistance to mildew and rot, 899.
- Thamnospectia (Synanthedon) scitula*—*see* Dogwood borer.
- Thermocouples for biological research, construction and installation, 486.
- Thermometers, soil, field-type, 167.
- Thiaminase, dietary, in fish products, human availability, 425.
- Thiamine—
- absorption by human subjects, from baker's yeast, 277.
 - action on germination and development of orchid seeds in asymbiotic media, 485.
 - and riboflavin in cereal products, combined determination, rapid method, 470.
 - assay by thiochrome method, factors influencing, 19.
 - assay in agar, *Phycomyces*, 639.
 - chloride, stability in mineral and vitamin-fortified cereal, 431.
 - content of—
 - blood and tissues, determination method, 471.
 - cereal products, determination, simplified colorimetric method, 471.
 - dried legume seeds, 428.
 - grain and flour of Kansas-grown wheat varieties, 280.
 - milk, determination, simple fluorometric method, 470.
 - pork in relation to thiamine fed, 93.
 - stored wheat, 281.
 - turkey, effect of roasting and reheating, Ky. 894.
 - deficiency—
 - nonavailability of fecal thiamine, 430.
 - relation to alcohol metabolism, 600.
 - determination in urine by thiochrome technique, 626.
 - effect of adsorbents, 426.
 - effect on utilization of dextrose and sucrose by rats, 136.
 - estimation, rapid field method, 624.
 - in baker's yeast, accessibility to rats for growth, 277.
 - intake, varied, effect on growth of rats in tropical environment, 745.
 - live yeast as source, inefficiency, 426.
 - retention in—
 - cooking pork and processing bacon, 428.
 - preparation of overseas hams and bacon, 279.
 - synthesis by *Neurospora*, genetic differences in strains, 35.
 - synthesis from active thiazole and pyrimidine moieties, 431.
 - urinary excretion, study by four methods, 775.
- Thielaviopsis basicola*, isolation from soil by means of living carrot disks, 670.
- Thiochrome method, for vitamin B₁ assay in foods, 18, 19.
- Thiochrome technique for determination of thiamine in urine, 626.
- Thiocyanate nitrogen, assay in organic thiocyanates and mixtures, 14.
- Thiocyanogen reagent and method, modified, for fats and oils, 472.
- Thiouracil—
- effect on—
 - growing swine, 234.
 - growth and fattening of broilers, 46.
 - mammary gland of rat, 46.

Thiouracil—Continued

feeding—

- high levels, cause of perosis in chicks, 567.
- to chicks, effects on glands, body weight, and dressing appearance, 499.
- to hens, effect on thyroid gland of chicks, 234.

Thread, sewing, selection, Ohio 751.

Threonine, assay by *Streptococcus faecalis*, 179.

Thrips—

- greenhouse, injury to spinach, 225.
- of Island of Hawaii, additions with three new species, 830.

Thunderstorms, thermodynamics, 167.

Thymine and vitamin B₆—

- Lactobacillus casei* response, 159.
- Streptococcus faecalis* response, 159.

Thymonucleodepolymerase, viscosimetric determination, 772.

Thyroid—

- desiccated, feeding to chicks, effects on glands, body weight, and dressing appearance, 499.

gland involvement in lowered fertility of rams, Mo. 800.

gland of rat, thyroxine content, determination, 771.

influence of—

- rape seed in chicks, 46.
- thiouracil in broilers, 46.

Thyroprotein, administration route, relation to utilization by ruminants, Mo. 372.

Thyroxine—

- administration route, relation to utilization by ruminants, Mo. 372.
- determination in thyroid gland of rat, 771.
- formation from diiodotyrosine, effect of experimental conditions, 449.

Thysanoptera, additions including three new species, Island of Hawaii, 830.

Tibet, marches, plant hunting, history of botanical exploration, 637.

Tick(s)—

- bite, lambs, enzootic staphylococcal infection, II, bacteriology, 563.
- bite, lambs, enzootic staphylococcal infection associated with, 246.
- collections at Army installations in Fourth Service Command, 700.
- in New York State, address, 543.
- repellents, garment spraying, observations, 839.
- water balance, 229.

Tillage, rotary applications, 571.

Tillage, soil, rotary, 571.

Tillus patagoniae n. sp. from Arizona, description, 688.

Timber(s)—

- management program in northeastern Minnesota, Minn. 114.

requirements, forest management needs of postwar era and future, Miss. 667.

Timber(s)—Continued

- West Indian, physical-mechanical—properties, U.S.D.A. 669.
- properties, II, U.S.D.A. 818.

Tipula—

- new species from western North America, 534.

three new species, descriptions, 687.

Tire cord, effects of temperature and humidity, 284.

Tissue extracts, citric acid assay in, 14.

Titration, conductometric, simplified apparatus, 10.

Titrimeter, description, 149.

Tobacco—

- alkaloids, physiological chemistry, recent concepts, development, 322.

blue mold in Georgia, 335.

bright, curing with coal and oil, Va. 723.

Connecticut 15, root-resistant type of shade tobacco, Conn. [New Haven] 662.

crop insurance in Tennessee, Tenn. 870.

diseases in 1945, Conn. [New Haven] 670.

Duvel buried seed experiments, final results, U.S.D.A. 201.

excised tissue cultures, growth in vitro, influence of composition of medium, 793.

farms, credit in Puerto Rico, 1939-40, P.R.U. 727.

fertilization, role of boron, 788.

glandular leaf hairs, significance, 647.

Havana seed, black root rot resistant strains for Connecticut Valley, Mass. 812.

leaf proteins, effects of mosaic virus, 213.

leaf-burn, influence by content of potassium, nitrogen, and chlorine, 663.

marketing and manufacturing margins, U.S.D.A. 115.

mosaic, symptoms in *Nicotiana* spp., genotype and temperature relations, 39.

mosaic virus—

- at different stages of infection, electron microscope study, 674.

effects on leaf protein properties, 213.

fractions, ultracentrifugal examination, 340.

inactivation by potassium salicylate, rate, 213.

separation and properties in different states of aggregation, 340.

transmission through larvae of *Plusia gamma*, 341.

necrosis, virus causing—

- purification and properties, further studies, 341.

ultracentrifugal examination, 341.

plants, infection by mosaic virus, effects on leaf proteins, 213.

ring-spot virus, cause of soybean bud blight, 212.

rosette, general study of virus complex and transmission, 71.

seed oil—

- analysis and fatty acid composition, 461.

Tobacco—Continued

seed oil—Continued

meal, protein content, nutritive value, 371.

nutritive value, 372.

seedbeds, sterilization by chloropicrin, Conn. [New Haven] 670.

seedlings, "frenching" due to isoleucine, 213.

statistics (1945), U.S.D.A. 116.

wireworm injury, influence of cover crops, Conn. [New Haven] 691.

yields, effects of lime, fertilizer, and preceding legumes, on Sango silt loam, Tenn. 803.

Tobacco research stations in India, notes, 760.

Tobacco Substation at Windsor, report for 1945, Conn. [New Haven] 662.

Tocopherol(s)—

antioxidant activity, temperature effects, 6.

antioxygenic synergism in preservation of carotene, 743.

blood plasma, determination, simplified hydrogenation technique, 627.

chemical assay of total, in mixtures of forms, 19.

concentrates, by fractional crystallization of cottonseed oil from solvents, 458.

determination in plant tissue, 772.

effect on resistance of rats to anoxic anoxia, 739.

in animal fats, chemical determination, 627.

α-Tocopherol—

chemical assay in mixtures of forms, 19.

pure, stabilizing agent for fats of poor keeping quality, 460.

γ-Tocopherol—

content in vegetable oils, assay, 160.

precursor of red quinoid substance developed in cottonseed oil during oxidation, 459.

p-Toluenesulfonamides, N-substituted, in codling moth larval control, 77.

Tomato(es)—

Arkansas, production, canning, and marketing, 1940–41, Ark. 262.

ascorbic acid content at cannery, determination by field illumination and handling, 603.

bacteriostatic factor in fruits, 33.

big bud in, relation to yellows of kok-saghyz and aster, 210.

blight control in southwest Virginia, Va. 677.

brown root-rot, control by chloronitrobenzene, 676.

canned—

by five home-processing methods, ascorbic acid value, La. 898.

in home, ascorbic acid losses, 898.

vitamin retention, effect of quantity preparation, 890.

Tomato(es)—Continued

cannery, anthracnose control, two years' results, Mich. 677.

crop, good, essentials, S.Dak. 201.

diseases in Mississippi (1945), U.S.D.A. 58.

fall production, Miss. 815.

fruit rot, caused by *Phytophthora capsici*, epiphytology and control, 345.

fruitworm control, Utah, 698.

fusarium wilt—

control by Dithane, 384.

relation to plant nutrition, 515.

juice, *D*-isoascrobic acid as antioxidant in, varieties compared, 72.

greenhouse production, improvement by use of 2,4-dichlorophenoxyacetic acid, Mich. 331.

guttation, effect of various ions, 506.

hormones, greenhouse tests, Minn. 202.

hybrid, superiority, Minn. 506.

juice, *D*-isoascrobic acid as antioxidant in, 124.

late blight—

1946, U.S.D.A. 824.

in east Texas at transplanting time, 344.

on Florida west coast, U.S.D.A. 58.

resistance to fusarium wilt, interpretation, 515.

seedlings, sun scald, production by "fine dust," 345.

southern stem blight resistance of lines and varieties, Miss. 186.

varieties, ascorbic acid content and its retention in processed products, 603.

varieties for preserve making, comparison, 882.

vitamin C changes during home canning and storage, Ohio, 432.

Tongue deformity in chicks, amino acid-deficiency role, 105.

Tools, encyclopedia of mechanics', 108.

Torsion in protoplasm of myxomycete, 87.

Torulopsis pulcherrima—

culture study, *Taphrina deformans* compared, 61.

pigment production, effect of iron and other factors, 489.

Township zoning, case study, Mich. 734.

Toxicology, veterinary, Lander's, rev., treatise, 386.

Toxoid, alum-precipitated, control of enterotoxemia in lambs, 855.

Trace element deficiencies, multiple, in agricultural crops, 509.

Tractors, costs and use on upland farms, La. 116.

Trajectory technique, in weather forecasting, 22.

Traps, steel, substitutes for capturing wild-life, 829.

Tree(s)—

Chinese-gallnut, general study, 57.

Christmas, species and culture comparisons, Ala. 57.

deciduous, defoliation, effects, 352.

Tree(s)—Continued

- diseases, epidemic, threat to shade trees in Michigan, 680.
drought effects, 187.
for Aleutian Islands, 181.
fruit—see Fruit(s) trees; also *specific kinds*.
heights, measurement by sectional pole, 687.
in prairie climate, ecological relations, 167.
in two climates, lecture, 779.
of Oklahoma, effect of chloride, Okla. 204.
planting machine, description, Mich. 109.
pruning by annual removal of lateral buds, 668.
radial growth at different altitudes, 817.
ring studies in North Dakota, N.Dak. 780.
solutions in, streaming movements, 642.
- Trefoil, birdsfoot—
characteristics and potentialities as forage legume, [N.Y.] Cornell 656.
propagation by root cuttings, 658.
- Tretoptileus opuntiae* n. gen. and sp., description and occurrence, 680.
- Tribolium confusum* attack, susceptibility of edible soya products in storage, Minn. 836.
- Tricalcium phosphate fertilizer, fused, animal feed supplement, 841.
- Trichinae, dehydration at 120° F., 395.
- Trichiniasis, mechanism of encapsulation, 388.
- 1-Trichloro-2-*o*-chlorophenyl-2-*p*-chlorophenylethane (*o,p'*-DDT isomer), dehydrochlorination, 296.
- Trichodectidae on rodents, descriptions, 88.
- Trichomonas*—
fixation and staining in cultures and vaginal mucus, simple technique, 243.
foetus inoculation in heifers, 387.
gallinae, pathogenicity to clean pigeons, 387.
gallinarum, behavior in culture, 722.
- Trichomoniasis, bovine, treatise, 245.
- Trifidaphis phaseoli*, damage to squash roots, 77.
- Trifolium pratense*, Duvel buried seed experiments, final results, U.S.D.A. 201.
- Tripsacum laxum*, sterility, cytological basis, 650.
- Tristesa disease of citrus—
iodine test, 679.
relation to nematodes, 679.
- Triticum vulgare*—see also Wheat.
heterosis, effects, 650.
- Trombicula deliensis*, with description of adult, 229.
- Trombiculid mite, *Acariscus masoni*, new host records, 522.
- Trombiculine larvae, identification by help of microphotography, 355.
- Tropaeolum majus*, stem tips and subjacent regions, development in sterile culture, 641.
- Tropical rat mite, *Liponyssus bacoti*, ectoparasite, and control, 522.

- Trout, lethal alkalinity in waters of low salt content, 525.
- Truck crops, production and prices, New York, [N.Y.] Cornell 262.
- Trypanosoma equiperdum* antigen for complement fixation, I, preparation and titration, 389.
- Tryptophan—
determination by rapid procedure, 301.
effect on pyridoxine-deficient mice, 128.
fate in pyridoxine-deficient and normal dogs, 601.
free, content of human urine, 610.
in blood, microbiological assay, 15.
in human urine, assay, 20.
influence on nicotinic acid requirement of chicks, 549.
utilization and synthesis by strains of *Lactobacillus arabinosus*, 593.
- Tryptophan-deficient diet, association with corneal vascularization in rats, 737.
- Tsetse flies of French West Africa, monograph, 700.
- Tuber flea beetle, food-plant effects on fecundity—I a r v a l development-abundance, Nebr. 82.
- Tubercle bacillus, effect of sour milk, 389.
- Tuberculin—
injections, s u b c u t a n e o u s, leucocytic changes resulting, 715.
test, application to pigs and sows, 247.
test, intradermal, blood leucocyte picture in bovines during reaction, 563.
- Tuberculosis, bovine, eradication, scoffing at, 393.
- Tulips, virus diseases—
history and general study, 75.
vectors, 75.
- Tumblemustard seed, oil, 459.
- "Tumefactions," camphor causing in onion roots, 183.
- Tumor(s)—
bone, in fowls injected intravenously with causative agent of Rous sarcoma, 396.
lymphoid, in chickens—
immunization, III, attenuation by heat, drying, and chemicals, 566.
production by filterable agent, 396.
- Tundra, Alaska, reactions to reindeer and other grazing, 349.
- Tung—
culture in southern Mississippi, Miss. 332.
kernels, grinding, effect of moisture, 462.
meal, solvent extraction, effect of moisture, 462.
oil, expression, 461.
oil, freshly extracted, spectrophotometric determination of alpha-eleostearic acid content, 302.
- Turax merula merula*, study, 221.
- Turkey(s)—
blackhead, control by phenothiazine, limitations, 569.
breeding for egg production and quality, U.S.D.A. 41.

Turkey (s)—Continued

- cecal worms, control by phenothiazine, limitations, 569.
 consanguinity of breeding stock, relation of hatchability to, 653.
 diseases, sulfathiazole treatment, inefficacy, 569.
 eggs infected with *Salmonella typhimurium*, bacteriological examination, 252.
 eggs, production and hatchability, inheritance, 499.
 enterprise, costs and returns, [N.Y.] Cornell 405.
 infection with swine erysipelas, 860.
 infectious sinusitis, treatment, 398.
 male, sexual maturity inheritance in, 45.
 ovulation, influence of light intensity, 710.
 paracolon bacillus, type 10—
 isolation, 568.
 occurrence, 568.
 poult—
 experimental edema and ascites, 252.
 feeding mung beans, 235.
 nicotinic acid deficiency and occurrence of perosis, 253.
 pullorum disease, sulfamerazine as prophylactic, 398.
 vitamin B₆ requirements, 552.
 rations, starting and growing, Ind. 848.
 respiratory disease, treatment by sulfamerazine, 569.
Salmonella typhimurium isolation from feces, 569.
 spirochetosis, 399.
 starting right, treatise, 380.
 synthetic estrogens, activity on oral administration, 234.
 thiamine content, effect of roasting and reheating, Ky. 894.
 Turnips, storage in bins with forced ventilation, progress report, Ohio 862.
 Turpentine, gum spirits, steam-distilled wood turpentine content, detection and estimation, 470.
 Turpentine, wood, destructively distilled, detection in gum spirits by aniline point, 21.
 Twins, production in *Gallus domesticus*, 803.
Tylenchus polyhyppnus n. sp.—
 from rye herbarium specimen, 75.
 viability after 39 years' dormancy, 75.
 Typhoid—
 fowl—see Fowl typhoid.
 mouse, genetic resistance, irradiation effects, 497.
 mouse, genetic resistance, physical basis, in constitution of liver and spleen, 326.
 Typhoons, ring of violent upward convection in (?), 23.
 Typhus control by DDT and "1080" in Southwest, 358.
Typophorus viridicyaneus—see Sweetpotato leaf beetle.
 Tyroglyphid mites in stored products, ecological studies, 539.
 Tyrosinase, in black bacteriosis of wheat, 63.

- Tyrosine groups, in serum albumin and pepsin, iodination, 3.
 Tyrosine groups, number computed in serum albumin and pepsin, 3.
 Tyrothricin, *Bacillus brevis* producing, 148.
Ulmus spp., hybridization procedure, 187.
Ulmus spp., self-sterility in, 187.
 Ultra-violet irradiation of spores of molds collected from bread, 323.
 Ultramicroscope—see also Microscope; Microscopy.
 particle counts, 755.
 Ultrasonic disintegration, method of extracting bacterial enzymes, 634.
 Umbelliferae in Iowa, fruit key, with plant distribution records, Iowa 484.
 Ucinula—
 new species and variety in China, 209.
 salicis, conidial germination, mechanism, 61.
 Union of Soviet Socialist Republics—
 aid to agricultural specialists, 725.
 plant physiology, 639.
 U. S. Department of Agriculture —
 notes, 447, 759, 912.
 report of Administrator of Agricultural Research (1945), U.S.D.A. 140.
 report of Secretary (1945), U.S.D.A. 140.
 United States Morgan Horse Farm, work and objectives, 44.
 U. S. Public Health Service, Henry R. Carter Memorial Laboratory, investigations, 540.
 United Kingdom, food consumption levels, U.S.D.A. 590.
 University of Florida Conservation Reserve, mammals, 219.
Uranotaenia bimaculata, larva and pupa, description and taxonomy, 866.
Uranotaenia n. sp. from Okinawa, 87.
 Urea—
 determination, micromethod, 469.
 excretion, influence of manganese intake, 887.
 partial protein supplement for beef cattle, progress report, 373.
 Urinary calculi in steers, 387.
 Urine—
 acidity, effects of food intake and anoxia, 427.
 excretion of ascorbic acid and dehydroascorbic acid under different environmental conditions, 740.
 growth inhibiting action on seedlings, 639.
 human, free tryptophan content, 610.
 inositol and *p*-aminobenzoic acid, occurrence, 740.
 N¹-methylnicotinamide excreted in, 159.
 of normal individuals, excretion of pyridoxine, "pseudopyridoxine," and 4-pyridoxic acid, 276.
 4-pyridoxic acid in, isolation, structure, and synthesis, 148.
 tryptophan content of human, assay, 20.
Urtica spp., perennial, in U. S. east of Rocky Mountains, 792.
 Uruguay, greenbug of cereals, 688.

Ustilago—

maydis, sporidial fusion, U.S.D.A. 210.

striiformis, nomenclature, U.S.D.A. 58.

Utah College, notes, 446, 608.

Vaccine, *Brucella abortus* strain 19, agglutinin response relation to dosage and site of inoculation, 390.

Vaccines, swine erysipelas culture, validity, Nebr. 565.

Vacreator, dual use for condensing milk and pasteurizing ice cream mix, Oreg. 852.

Vacuum systems, control, simple automatic, 769.

Vanilla, curing, P.R. Fed. 162.

Varnish, bakelite, for honey extracting equipment, 702.

Vegetable(s)—

ascorbic acid and carotene losses in large-scale cooking, Ala. 131.

blanching and cooling for frozen pack, 417.

blanching, electronic method, 125.

canned, drained and liquid portions, distribution of nutrients, 588.

canning cooperatives, status, 1943-44, U.S.D.A. 584.

carotene content—

physiological availability to rat, 598.

value for growth of white rat, 597.

crops, diseases in Florida, 335, 336.

dehydrated, nutritive value, oxidative enzymes, and other factors, 878.

dehydrated, sales and consumer acceptance in Grand Rapids, Mich., U.S.D.A. 872.

dehydration, varietal suitability, 122.

disease-resistant, lists, 475.

diseases in Georgia (1945), U.S.D.A. 58.

diseases on Florida east coast, U.S.D.A. 58.

farming, economic studies, New York, III, [N.Y.] Cornell 262.

freezing, home, 418.

importance of maturity, 881.

fresh—

harvested, ascorbic acid content, 602.

nutritive-value retention, 121.

shelf life, lengthening, Ohio 877.

freshness, preservation from harvest to consumption, 266.

garden, seed treatments in western Washington, Wash. 215.

gardener, handbook on insects and diseases, U.S.D.A. 505.

green, improvement of diet, Miss. 886.

Hawaiian-grown, iron availability, 595.

icing, effects on retention of quality and ascorbic acid, 895.

juices, growth factor, 319.

moisture losses during steaming, quick freezing, and packaging, 880.

plants, production, Mo. 201.

preservation, by sulfur dioxide solution, 126.

pressure-cooker gauges and, 125.

processed, Government inspection, questions and answers, U.S.D.A. 404.

Vegetable(s)—Continued production—

and marketing in Georgia mountain counties, Ga. 404.

glass plant protectors, Del. 664.

relation to freight rates in New Mexico, N.Mex. 869.

products and byproducts, 265.

protein-solution viscosity patterns, methods and comparisons, 2.

quantity cooking, vitamin retention, 277.

respiration, Pasteur effect, 492.

seed treatments—

1944, report by American Phytopathological Society, U.S.D.A. 674.

Oklahoma, Okla. 214.

seeds on sale in New York, 1945, quality, N.Y. State 333.

spoilage bacteria from, in home canning, 124.

storage organs, respiration, relation of anaerobic to aerobic, 492.

use in Hawaii, Hawaii 734.

vitamin C content, polarographic assay, 18.

vitamin P content, influence of chemical treatment, 749.

Vegetation, types, ground conditions, estimation from aerial photographic interpretation, 687.

Vegetative cover—

analogs in Ukraine and Norway vs. U.S., U.S.D.A. 168.

eroded soils, plant-growth conditions, 26.

Veneer, checks, measurement method, 669.

Venezuela, policy measures and food production, 724.

Ventilation—

electric, of poultry houses, 258.

forced in turnip storage bins, Ohio 862.

Venturia pirina, conidial pustules and role as necrotic canker foci, 73.

Verbascum thapsus, Duvel buried seed experiments, final results, U.S.D.A. 201.

Vermont Station—

notes, 446.

report, Vt. 286.

Verticillium wilt of sainfoin, cause and incidence, 673.

Vetch, hairy, plowing under, effect on cotton yields and Lufkin fine sandy loam, 196.

Veterans, programs in rural areas, planning, [N.Y.] Cornell 264.

Veterinary miscellaneous papers, 558.

Virosis, genetic disease of white clover resembling, 39.

Virus(es)—

crystalline plant, electron micrographs, 468.

diseases of plants and insect vectors, Hawaii, 820.

infectivity at various concentrations, theoretical study, 58.

investigations, value of serology for, 208.

molecular weights and other properties, determination by light absorption, 208.

- Virus(es)**—Continued
 nature, general review, 483.
 persistent and nonpersistent plant, transmission by same vector, 70.
 proteins, isoelectric point, determination by stain technic, 50.
 reproduction, nature, 59.
- Viscometer**, for volatile mixtures and low-temperature determinations, 147.
- Viscosimetric determination of thymonucleopolymerase**, 772.
- Vision-flight correlations in insects**, 78.
- Vitamin(s)**—
 added to beer, stability, 424.
 effects on aircraft workers of southern California, 419.
 feeding to poultry, Nebr. 846.
 from yeasts, availability, I-II, 277.
 frozen standards, 470.
- in**—
 canned foods, influence of temperature and storage time, 742.
 canned foods, values obtained by different methods of assay, 623.
 canned pineapple, 742.
 cheeses, green and ripe, and comparison with original milk content, 556.
 colostrum milk, 98.
 dehydrated eggs, 423.
 frozen peas, green beans and lima beans, and market-fresh yams in mess hall, 889.
 kale frozen in field, 413.
 Mexican foods, 127.
 peas, effect of freezing, canning, and dehydration, 891.
 pharmaceutical products, availability determination, 424.
 rice, effect of milling, processing, washing, cooking, and storage, Ark. 893.
 snap beans, as influenced by home freezing and cooking, 132.
 sweetpotato gels, 122.
 nutritive value retention in fresh produce, 121.
 physiological availability, I-VI, 425.
 potency of pork, influence of rations, Mo. 422.
 preventive and therapeutic use, 131.
 requirements of *Mcmonnicella* and *Stachybotrys*, 484.
 research progress reports, U.S.D.A. 141, Ala. 143.
 retention in—
 blanched carrots, alcohol-insoluble solids as reference base, 775.
 canned tomatoes, effect of quantity preparation, 890.
 frozen peas and frozen green beans in quantity food service, 889.
 quantity cooking of vegetables, 277.
 studies on lima beans, 888.
 supplementary, value for young dairy cows, controlled experiments, 382.
 tolerance curve, 747.
 values of snap beans, 423.
- Vitamin A**—*see also* Carotene.
 activity of—
 carotene in green fodder, 545.
 neo- β -carotene U and its steric rearrangement in digestive tract of rats 743.
 and carotenoid levels in cattle, 232.
 assay by ultraviolet absorption, basis of correction values for, 157.
 assays, standards, U.S.P. reference cod liver oil vs. beta-carotene, 470.
 bodily storage, relation to diet—
 and age, study by antimony trichloride reaction, 599.
 and age, study by assay method of single feedings, 598.
 Carr-Price color reaction for, light effects on, 156.
 colorimetric determination, 623.
 colorimetric reaction, new, spectrophotometric study, 624.
 content of—
 Arizona butter, 278.
 blood plasma, form, 132.
 creamery butter in Minnesota, 133.
 dehydrated eggs, spectro-chemical determination method, 157.
 dried whole eggs, chemical determination, 775.
 market butter produced in Kansas, 892.
 deficiency, weights before and after β -carotene administration in rats, 132.
 in nutrition of guinea pig, 597.
 potency of cod liver oil, 423.
 potency of milk and butter in Louisiana, two-year study, La. 891.
 requirements of calves, 374.
 reserves of new-born calf, effect of prepartum diet of cow, 382.
 storage in rats' livers, measure of relative values of carotenes in foods, 278.
 therapy in control of ketosis of dairy cows, 560.
 utilization by foxes, comparison with carotene, 521.
 utilization, effect of protein level of diet in rats, 133.
- Vitamin B**—
 complex—
 human requirements, 133.
 source in coprophagy by self-selection of rats, 279.
 source for poultry rations, Colo. 235.
 content of raw and cooked sweetpotatoes, 278.
 effect on fat metabolism, test with choline, 594.
 retention in oatmeal during cooking, 599.
 stability in grape juices and wines, 279.
- Vitamin B₁**—*see also* Thiamine.
 in foods, extraction procedures for assays, 18.
 in cereals, amounts and supplying human requirements, 428.

Vitamin B₁—Continued

moieties, thiazole and pyrimidine, biological estimation, 431.
preservation in lima beans, Miss. 743.

Vitamin B₂ - group—

conversion into codecarboxylase, 769.
function, pyridoxal phosphate in transamination, 768.
studies, 157.
multiple nature, critique of methods for determination of complex and components, 225.
replacement in micro-organisms by *d*(---)-alanine, 158.

Vitamin B₃— and thymine—

Lactobacillus casei response, 159.
Streptococcus faecalis response, 159.
conjugase from chicken pancreas, 614.
conjugate, microbiological assay, 624.
crystalline, relation to cellular elements of chick blood, 234.
requirements of turkey poults, 552.

Vitamin C—see also Ascorbic acid.

changes in tomatoes during home canning and storage, Ohio 432.

content of—

apples, effect of ripening, storage, and other methods of handling, Iowa 898.
black currants, as influenced by cold processing, 137.
fruits and vegetables, polarographic assay, 18.
guavas, 283.
Maine-grown potatoes, effects of storage, 661.
Mexican foods, new values, 281.
milk, effect of degeneration, 555.
milk, effect of feeding, cod-liver oil, 554.
peaches, effect of processing, S.C. 891.
potato plant and tubers and factors influencing, 136.
potatoes, effect of storage conditions in Maine, 897.
rose hips, 424.
strawberries, breeding for, N.Y. State and Cornell 817.
determination in presence of interfering reducing substances, method, 627.
determination, selective oxidation-reduction method, 627.
nutrition of rural population in middle Tennessee, 746.
production by sprouting seeds, 281.
wound-healing role, 101.

Vitamin D—

potency of cod liver oil, 423.
potency of moldy wheat bran mash, 430.
requirements of goslings, 710.
requirements of ducklings, 552.
secretion in milk of women fed fish liver oil, 748.

Vitamin D₂, colorimetric reaction, 18.Vitamin D₃, colorimetric reaction, 18.

Vitamin E—

deficiency, effects in inhibition of pigment deposition in incisor teeth of rats, 432.
in blood plasma, analysis, 628.
prevention and cure of "stiff-lamb disease," 855.

Vitamin K deficiency, effect on liver lipids in chick, 720.

Vitamin M, relation to *Lactobacillus casei* factor, 748.

Vitamin P content of vegetables, influence of chemical treatment, 749.

Voltmeter, vacuum-tube description, 149.

Wages, seasonal farm workers—

in citrus harvest, Los Angeles area, April-June 1945, U.S.D.A. 406.
U.S.D.A. labor supply centers, Calif., June 1945, U.S.D.A. 406.

Wagner flat peavine forage, digestibility and composition at growth stages compared, 91.

Walnut—

English—see Walnut, Persian.
Persian, diseases in Pacific Northwest and their control, Oreg. 828.

production in California, Calif. 205.

War damage in Far East, report, 608.

War, impact on civilian consumption in United Kingdom, U. S., and Canada, 590.

Washington College, notes, 288, 759.

Washington Station, notes, 446.

Washington Station, report, Wash. 441.

Wasps, solitary, behavior, 222.

Wastes, agricultural, investigation, Mass. 308.

Water—

absorption, measurement by accelerated method, 12.

acetone-benzene mixtures, analysis data for, 21.

and forests, U.S.D.A. 333.

and light in pine production, 333.

2,3 butylene glycol mixtures, liquid-vapor equilibrium, 164.

determination in—

dry foods, Fischer method, 150.

naval stores, Fischer method, 150.

electrical heating for livestock, U.S.D.A. 257.

for modern farmstead, U.S.D.A. 257.

gas-holder, fouling, prevention, 32.

ground, in High Plains of Texas, 570.

ground, supply of Prospect Valley, Colo., Colo. 861.

levels and artesian pressure in—

observation wells, 1943, Northwestern States, Part 5, 400.

observation wells, 1943, in U.S., Parts 3, 4, 861.

meter, furrow, new, 107.

meter, portable field, new, 107.

runoff, early investigation, 785.

soil—

measuring methods compared, 170.

relations, apparatus for recording, 108.

Water—Continued

solubility in alcohol-hydrocarbon mixtures, 166.

surface supply of U.S.—

1943, part 3, Ohio River Basin, 399.

1944, parts 1, 2, 8, and 12, 861.

1944, parts 4, 7, 9, 10, 11, and 14, 399.

quality, southern areas, 1943, 399.

Water-repellent materials, tests, devices for producing artificial rainfall, 750.

Watermelon nematodes, control by D-D mixture, 334.

Waterproof materials, tests, devices for producing artificial rainfall, 750.

Waterways, grassed, successful practice, 570.

Wax, in cotton fiber, determination by alcohol extraction method, 155.

Wax pencils for writing on cold wet glassware, 471.

Weather—

affecting cranberries, report, 836.

and North Dakota crop season (1945), N.Dak. 168.

detrimental to fruiting of grape vines, 1945, Ohio 779.

forecasting, trajectory technique in, 22.

in Kansas (1945), 168.

in northwestern Canada, 23.

in Ohio, highlights, 1944 and 1945, 310.

Influence on insects, discussion at joint meeting in London, June 20, 1945, 780.

injuries to fruits and fruit trees, Va. 629.

solar variation influences, 166.

Weathering, effect on cotton fabric containing copper rot-proofers, 604.

Weed(s)—

control—

by 2,4-D, factors influencing, Colo. 329.

by 2,4-D on sugarcane lands, U.S.D.A. 811.

by 2,4-D, period of effectiveness, 813.

by new acid as fertilizer supplement, N.Y. State and Cornell 814.

chemical, 201.

in carrots and related crops by oil sprays, Mich. 328.

research by experiment stations, progress reports (1945), U.S.D.A. 142.

lawn, destruction with 2,4-D, N.J. 504.

of Louisiana, investigations, La. 504.

threats, four, Utah 664.

tropical, killer, U.S.D.A. 664.

Weeding, flame, efficacy, N.Y. State and Cornell 401.

Weighing funnels, descriptions, 149.

Welding, electric, economy on cost of steel building frames, Wis. 400.

Well(s)—

artesian pressure, 1943, 861.

common, monograph, 399.

observation, water levels and artesian pressure, 1943, Northwestern States, 400.

Wheat—see also *Triticum vulgare*.

alcohol from, malt evaluation, 166.

Wheat—Continued

amylase inhibitor—

mode of action, 613.

preparation and properties, 613.

bacterial black chaff, diagnosis, 213.

better, for New York, [N.Y.] Cornell 504.

black bacteriosis, tyrosinase factor in, 63.

bran mash, moldy, antirachitic potency, 430.

cercospora eyespot, nitrogen effects, 64.

crop insurance in Tennessee and U.S., Tenn. 407.

diseases, 334.

eyespot in Scotland in 1944, 671.

fall-seeded, winter injury in Idaho, 335.

flag smut in Mexico, 511.

germ oil antioxidants, effect on stability of whole milk powder, 415.

germ oil, compositions, 462.

germinated, analyses, effects of variety and environment, 290.

grain, auxin-protein complexes, 485.

ground, utilization by growing chicks, comparison with ground rye, Nebr. 547.

hard—

red spring hybrids, milling and baking in relation to weight and protein content, 48.

red spring, leaf and stem rust effects on phosphorus metabolism, 64.

winter, protein quality, evaluation, 306.

hessian fly resistance derived from W38 and durum P.I. 91587, 500.

high, poultry rations, supplements in riboflavin and manganese, 708.

Kansas-grown varieties, grain and flour, thiamine and riboflavin content, 280.

kernel, composition, 289.

leaf rust in Oklahoma and Texas, 336.

leaves, rust and phosphorus distribution, 674.

loose smut—

fungi in embryos, detection, 63.

incidence in West Virginia, seasonal U.S.D.A. 58.

mosaic, development, effect of chemical soil treatments, Wash. 214.

new variety—

beardless (Cadet), N.Dak. 200.

Vahart, Va. 200.

Oklahoma farm improvement program, progress report, 1938-45, Okla. 812.

plants, defoliation, artificial, effects, preliminary observations, 503.

resistance to hessian fly, relation to temperature, 224.

roots—

association with colonies of *Xanthomonas vesicatoria*, Ky. 214.

inorganic ions, absorption, transport, and exudation, 489.

rot, incidence, influence of time, rate, and depth of seeding, Wash. 214.

rust-resistant new varieties, 64.

× rye × *Elymus*, trigeneric hybrids, 649.

Wheat—Continued

- Say stinkbug feeding, effect, 360.
seed—
and seedling infection by *Xanthomonas translucens* var. *cerealis*, 510.
quality, importance, [N.Y.] Cornell 813.
treated, effect of storage, 342.
"sick," development in sealed containers, factors affecting, 291.
spring, hessian fly infestation in south-western North Dakota, N.Dak. 360.
starch content, determination, improvements, 472.
starch, fat and phosphorus extraction, 3.
stem—
distortion, 827.
rust and yellow berry, 342.
rust fungus, physiological races in France, 512.
rust reaction, effect of DDT, 342.
sawfly attack, reaction of barley varieties, 688.
stored, thiamine content, observation, 281.
straw, furfural-yielding constituents, as influenced by sodium hydroxide solutions, 6.
substitutes, improvement of diet, Miss. 886.
take-all, etiology, 341.
technology, role of enzymes, volume, 762.
variegation in, maternal inheritance, 187.
varieties—
effect on maltose values, 813.
Illinois-adapted winter, Ill. 199.
North Dakota-adapted, N.Dak. 199.
viability loss, effect of fumigation and relation to baking quality, 813.
washing plants, fouling, prevention, 32.
winter, varieties for Oklahoma, Okla. 663.
yellow berry and stem rust, 342.

Wheat grass(es)—

- competition from cheatgrass brome, effects, 327.
crested, beginnings in North America, 807.
crested, production and utilization costs on wheat farms, Oreg. 112.
Wheel bug, predator of Japanese beetle, 355.
Whiptail in cauliflower and broccoli crops, control by ammonium molybdate, 512.
Wild rice, Canada aphids on, 360.
Wild rye, Mandan, description and value N.Dak. 656.

Wildfire return, Conn. [New Haven] 670.

Wildlife—

- capture by snares and deadfalls, 829.
of Texas, geographic distribution, 829.

Wind—

- abrasive and translocating actions, 172.
erosion—see Erosion.
indicators, dial, description, 309.
speed, experimental maximeters, 628.
transport capacity, 172.

Windbreak planting at Akron, Colo., 3 years, Colo. 818.

Wine(s)—

- grape, vitamin B stability, 270.

Wine(s)—Continued

- microorganisms, 884.
monochloroacetic acid in, persistence, 8.
Wings and ocelli correlated in insects, 78.
Winogradsky, Sergei Nikolaevitch, Sept. 1, 1856–Aug. 31, 1946, great bacteriologist, 780.

Winter—

- fat, high protein content valuable in forage for Colorado ranges, Colo. 231.
hardening—see Hardening.
rainfall, foreshadowing in Florida and Montana, 23.

Wireworms—

- control, cultural practices and rotations in, 82.
control, ethylene dibromide and DD mixture compared, 82.
injury to tobacco, influence of cover crops, Conn. [New Haven] 691.
investigations, 352.

Wisconsin Station—

- notes 288, 759.
report, Wis. 441.
Wisconsin University, notes, 288, 759.

Women—

- clothing, tailoring techniques, for suit, U.S.D.A. 139.
college, nutritional status, relation to dietary habits, vitamin stores, Iowa 897.
Cornell University, dietary study, 885.
midwestern college, nutritional status, 590.
nutritive status, metabolism of calcium, nitrogen, and phosphorus, Iowa 886.
pregnant, diet, meat in, 885.

Wood(s)—

- natural resistance to termite attack, U.S.D.A. 696.
neotropical, lignin, ash, and protein content, P.R.U. 669.
preservatives, international test, progress report, 838.
preservatives, naphthenates of copper and mercury, 519.
saccharification—
kinetics, 21.
quantitative method, 162.
rotary digester, 22.
sugars, analysis methods, 153.
sugars, fermentation to alcohol, 162.
turpentine, steam-distilled content of gum spirits, detection and estimation, 470.
Wood-boring insect, galleries, white deposit, composition and origin, 544.
Wood-destroying fungi, alcoholic fermentation of carbohydrates and dehydrogenation of alcohols, 347.
Woodland, invertebrates, abundance variations in Illinois, 350.
Woodworking, handbook, 108.

Wool—

- and its upkeep, S.Dak. 433.
clip, 1944, marketing, Commodity Credit Corporation Purchase Plan, U.S.D.A. 729.

- Wool- Continued
 fat, cholesterol separation from, 156.
 laboratory, capacity increase by simple improvements, 285.
- Working conditions, rural—
 construction of opinion scales, [N.Y.] Cornell 119.
 opinions of university women, [N.Y.] Cornell 119.
- Wounds, vitamin C role in healing, 101.
- Wyoming Station, report, 1943, Wyo. 605.
- X-rays—
 effect on bone growth in pigeons, 47.
 in combination with colchicine or acenaphthene, effect on plant tissue, 207.
 Irradiation, effects on genetic resistance of mice to mouse typhoid, 497.
- Xanthomonas*—
 minimal nutritive requirements, 208.
phaseoli, association with common bean mosaic virus, II, III, 823.
phaseoli var. *sojense* infection of soybeans severity, relation to stomatal behavior, 339.
translucens—
 parasitism on cereals and grasses, 62.
 var. *cercalis*, infection of barley, bromegrass, and wheat, 510.
vesicatoria, growth and overwintering in association with wheat roots, Ky. 214.
- Xanthone spray residues, colorimetric analysis, 156.
- Xanthophyll, content in plants, determination, 154.
- Xanthurenic acid excretion—
 factors affecting, 431.
 in pyridoxine-deficient mice, as influenced by casien vs. tryptophan, 128.
- α -Xylose, quantitative determination by selective fermentation, 302.
- Yam bean, insecticidal resin of, constituents, 9.
- Yarns, cotton—see Cotton yarns.
 resistance to insect pests, increase, compounds for, evaluation, 435.
- Yeast(s)—
 baker's, activity and moisture content, effect of desiccation, 321.
 chromosomes, staining by Feulgen technique, 646.
 distillery, chromosomal behavior, 41.
 effects of various chemicals, 633.
 enzyme producing *Streptococcus lactis* R-stimulating factor from inactive precursor substance, 614.
 genetics, review, 41.
 growth, enhancement by nitrogen mixtures, 36.
 growth, inhibition by tryosine-glycine mixture, 37.
- Yeast(s)—Continued
 pigment production, effect of iron and other factors, 489.
 preserved two years by lyophil process, viability, 321.
 protein, nutritional value to rat and chick, 591.
 soil, lipid production by, 25.
 sugar utilization, rare forms, 178.
 therapeutic effect on poikilocytosis in dairy cattle, 382.
 vitamins, availability, I-II, 277.
- Yellow-fever—
 mosquito -
 control by spray mists, 528.
 feeding through animal membranes, 227.
 life history and biology in South America, 87.
 toxicity of DDT, affect of water, 224.
 virus, hosts and vectors in two Brazilian forests, 219.
- Yellow--
 mealworm, sodium metarsenite resistance, 85.
 rust of raspberries, physiologic races in western Washington, 346.
 scale, infestation coincident with soft scale, role of ants in, 77.
 wilt of sugar beet in Argentina, U.S.D.A. 826.
- Yellows see also specific host plant.
 virus in sour cherries, expression, effects of temperature, 315.
- Yolk, unabsorbed, in chicks, 551.
- Youths, farm, not enrolled in school, N.C. 732.
- Zea mays*—see also Corn; Maize.
 photoperiodism and sex, 649.
- Zebu, roughage digestibility, crude fiber effects in cattle vs., 91.
- Zein fibers, preparation by wet spinning, 764.
- Zeisel methoxyl values for pectin, errors from retained alcohol, 154.
- Zinc—
 flax deficiency in, 66.
 phosphide poisoning, experimental, in fowls, 397.
 toxicity in rats, antagonistic effects of copper and liver, 841.
 value in dusts, trials, 821.
- Zinnia—
 "root nodules" due to nematodes, 218.
 seed, perithecia of powdery mildew on, 347.
- Zoopagaceae, three new on soil amoebae, 315.
- Zygnemataceae, from Louisiana and Texas, 180.
- Zygophiala jamaicensis* n. gen. and sp. description, 519.
- Zygophyllaceae, bacterial root nodules. 639.

INDIAN AGRICULTURAL RESEARCH
INSTITUTE LIBRARY
NEW DELHI.

[illegible]

S. C. P.—1/8/47 P. J.-3-5-48-2000